

**PACIFIC SALMON COMMISSION
JOINT CHUM TECHNICAL COMMITTEE
2006 POST SEASON SUMMARY REPORT**

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1. INTRODUCTION

This Pacific Salmon Commission (PSC) Joint Chum Salmon Technical Committee report presents the appropriate information on chum salmon stocks and fisheries in southern British Columbia and Washington for the year 2006 to address the specific provisions and requirements of the 2006 version of Chapter 6, Annex IV of the Pacific Salmon Treaty (PST) (Attachment 1).

The treaty between the governments of Canada and the United States of America (U.S.) concerning Pacific salmon was designed to facilitate co-operation between the two countries in the management, research and enhancement of Pacific salmon stocks. Chapter 6 of Annex IV (Chum Annex) of the PST required that certain fisheries for chum salmon in southern British Columbia (B.C.) and Washington be managed in a specified manner. In each country other fisheries, while not specifically mentioned in the PST, are known to harvest chum salmon originating in the other country. This report presents various aspects of the chum found in Washington State and in B.C. waters between Vancouver Island and the mainland and off the west coast of Vancouver Island, and discusses the management actions of Canada and the U.S. in relation to the PST requirements.

In 1999 a new Chum Annex was negotiated and adopted by the parties for a term of 10 years (Appendix 1). Certain provisions of this Annex were updated, relative to earlier versions, to be consistent with the changes in the "Clockwork" management strategy implemented by Canada for fisheries in Johnstone Strait. It also included additional conservation provisions to address concerns of the United States for Hood Canal-Strait of Juan de Fuca summer chum salmon, which have been listed as a "threatened" species under the United States' Endangered Species Act.

In 2002, Canada implemented a significant change in Southern B.C. chum management replacing the "Clockwork" stepped exploitation rates in favor of a fixed fishing schedule designed to approximate a total harvest rate of 20%. The Parties managed their fisheries through 2006 within the spirit of the existing Annex and the Commission's guidance.

In 2004, the Parties were given additional Commission guidance that modified certain provisions of the Chum Annex (Appendix 2). The purpose of the guidance document was to provide Commission direction to the Southern Panel on the conduct of southern chum salmon fisheries for the years 2004 to 2008. This direction was not intended to replace Annex IV, Chapter 6 of the Pacific Salmon Treaty but to address a change in Canadian management, which suspended development of pre-season run size estimates of chum to Canadian waters. The guidance document outlined agreements on fishery modifications. One modification disconnected the harvest levels in the U.S. from catch volume in Canada. The U.S. fishery in Areas 7 and 7A was managed pursuant to the Commission guidance to the Southern Panel on the management of southern chum fisheries. Another modification further provided for an additional linkage of the U.S. fishery, in Area 7 and 7A, to the abundance of chum salmon returning to the Fraser River. Additionally, the guidance document provided for conditional exploitation rates for Canadian fisheries based on specific levels of abundance.

In 2006, a new agreement was concluded between the Government of Canada and the Government of the United States of America which amends Annex IV of the PST (1985). These Parties managed their fisheries in accordance with this agreement as described in Attachment 1.

2. STATUS OF TREATY REQUIREMENTS

Chum stocks and fisheries in southern British Columbia and in United States Areas 4B, 5, 6C, 7, and 7A (*See: Attachment 1*) are managed under the terms set out in the 2006 Chum Annex of the PST. The following provides a brief synopsis of the provisions of the Chum Annex and of Canadian and U.S. management actions taken to meet those provisions for the year 2006.

2.1 Paragraph 1:

The Parties were to maintain a Joint Chum Technical Committee (Committee) to review stock status, develop new methods for stock management and report on management and research findings.

After the 2006 fishing season the Committee convened three times in 2007, during the PSC post-season annual meeting, the PSC pre-season annual meeting and for additional work at the PSC office later in the year. The Committee completed the 2005 annual post season report, and work on developing criteria for endowment fund projects specific to the Chum Annex. The Committee also provided technical support to the Southern Panel in its efforts to re-negotiate the Chum Annex.

2.2 Paragraph 2:

The catch composition of fisheries covered by this chapter will be estimated by post-season analysis using methods agreed upon by the Committee.

The Committee used agreed upon methods to assess catch composition estimates for 2006 fisheries, using historical estimates of stock contribution. These historical estimates may no longer be representative of the current chum catch composition in Southern B.C. fisheries. The Committee is currently evaluating new methods of assessing chum catch composition.

2.3 Paragraph 3:

Canada and the United States assess catch levels and make attempts to collect additional genetic samples from any chum salmon caught during the July 1 through September 15 time period in the boundary area fisheries (U.S. Areas 4B, 5, 6C, 7 and 7A; Canadian Areas 18, 19, 20, 21, and 29).

Tables 4 and 11 provide the harvest of chum salmon during the period of summer chum migration in boundary areas. Due to the low numbers of chum encountered during this time period, neither party collected any genetic stock identification (GSI) samples.

2.4 Paragraph 4:

During the period from July 1 through September 15, Canada will require the live release of chum salmon from all purse seine gear fishing in the Strait of Juan de Fuca (Canadian Area 20) and the United States will require the same for the non-Indian seine fisheries in Areas 7 and 7A. Note: By U.S. regulation, purse seine fisheries are not permitted in U.S. Areas 4B, 5 and 6C.

Regulations were implemented by both countries to require the live release of chum salmon in these areas during this time period.

2.5 Paragraph 5:

In the years 2006 through 2008, Canada will manage its Johnstone Strait, Strait of Georgia, and Fraser River chum salmon fisheries to provide continued rebuilding of depressed naturally spawning chum salmon stocks, and, to the extent practicable, not increase interceptions of U.S. origin chum salmon. Terminal fisheries conducted on specific stocks with identified surpluses will be managed to minimize interception of non-targeted stocks.

Table 1 provides an evaluation of the performance of the Clockwork (1997–2001) and current Johnstone Strait management strategy (2002–2006). Historical GSI as well as samples taken in 2006 indicated a continued low contribution of U.S. stocks in Johnstone Strait, Strait Georgia and Fraser River chum salmon fisheries.

Information regarding the contribution of depressed natural spawning chum in the catch was not available to the Committee.

Fishery descriptions indicated that terminal areas fisheries were generally managed to minimize the interception of non-targeted stocks.

2.6 Paragraph 6:

In the years 2006 through 2008, Canada will manage its Johnstone Strait mixed stock fishery as follows:

- a) In the years 2006 through 2008, chum salmon abundance levels of less than a provisional threshold of 1.1 million will be defined, for purposes of this chapter as critical. By the end of 2008, Canada will determine a revised critical threshold.*
- b) For run sizes above the critical threshold, Canada will conduct fisheries with a combined exploitation rate of up to 20% in Johnstone Strait.*
- c) When run sizes are expected to be below the critical threshold, Canada will notify the United States and will only conduct assessment fisheries and non-commercial fisheries. Other commercial fisheries targeting chum salmon will be suspended.*

The abundance below the critical threshold was not identified by Canada in 2006. Canada planned and managed its Johnstone Strait fishery for a maximum total exploitation rate of 20% (Table 1). The U.S. was notified by Canada of the abundance status.

2.7 Paragraph 7:

In the years 2006 through 2008, Canada will manage its Fraser River fisheries for chum salmon as follows:

- a) *For Fraser River terminal area run sizes, identified in-season, at abundance levels lower than 900,000 chum salmon, the Canadian commercial chum salmon fisheries within the Fraser River and in associated marine areas (Area 29), will be suspended.*
- b) *For Fraser River terminal area run sizes, identified in-season at levels greater than 900,000 chum salmon, Canadian commercial chum salmon fisheries within the Fraser River, shall be guided by the limits of the in-river Total Allowable Catch set by Canada.*

Inseason estimates indicated a terminal return higher than the specified Fraser River gross escapement threshold. Fisheries proceeded as per the Fraser River management rules (section 3.3.2.1).

2.8 Paragraph 8:

Canada will manage the Nitinat gill net and purse seine fisheries for chum salmon to minimize the harvest of non-targeted stocks.

In 2006, Canada addressed specific by-catch concerns by delayed opening dates, the use of reduced fishing area, the use of weed lines, and species selective fishing techniques.

2.9 Paragraph 9:

For the years 2006 through 2008, Canada shall conduct a genetic sampling program of chum salmon taken in the West Coast Vancouver Island troll fishery if early-season catch information indicates that catch totals for the July 1 through September 15 season may reach levels similar to 1985 and 1986. Sampling, should it occur, will include catches taken from the southern areas (Canadian Areas 121-124).

Chum catch levels in the 2006 West Coast Vancouver Island troll fishery were significantly below the 1985 and 1986 levels. Therefore, no GSI sampling occurred.

2.10 Paragraph 10:

In the years 2006 through 2008, the United States will manage its chum salmon fishery in Areas 7 and 7A as follows:

- a) *In the years 2006 through 2008, chum salmon abundance levels of less than a provisional threshold of 1.1 million will be defined, for purposes of this chapter, as critical. By the end of 2008, Canada will determine a revised critical threshold.*
- b) *For run sizes above the critical threshold, the base catch ceiling for the U.S. chum salmon fisheries in Areas 7 and 7A will be 130,000 chum salmon.*

- c) *For run sizes below the critical threshold, the U.S. catch of chum in Areas 7 and 7A shall be limited to chum salmon taken incidentally to other species and in other minor fisheries, but shall not exceed 20,000, provided that catches for the purpose of genetic stock identification sampling shall not be included in the aforementioned limit.*
- d) *The Fraser River chum salmon abundance estimate will be updated no later than October 22. If the run size is estimated to be less than 900,000, the United States will take immediate action to restrict its fishery impacts on Fraser chum. The Parties will then meet within 3 days of the update to discuss further U.S. fishing opportunities to meet conservation objectives*
- e) *U.S. commercial fisheries for fall chum salmon in Areas 7 and 7A will not occur prior to October 10.*
- f) *The United States will manage the Areas 7 and 7A fisheries for chum salmon with the intent to minimize, to the extent practicable, the harvest of non-targeted species.*

2.11 Paragraph 11:

In the years 2006 through 2008, the United States' annual total harvest ceiling for chum salmon in Areas 7 and 7A, shall be defined as follows:

- a) *It is the intent of the parties to eliminate the accumulated historical difference (138,000 total, as of the start of 2006), by 2008. Therefore, in any non-critical year in which a portion of the assigned difference is not taken, that portion shall be foregone.*
- b) *When the chum salmon run size is below the critical threshold, the base catch ceiling will be 20,000 chum salmon. When the fishery is limited to 20,000 chum salmon, the portion of the accumulated historical difference will not be added to the catch ceiling and the remaining accumulated historical difference will be recalculated and applied to subsequent years, up to and including 2008.*
- c) *When the chum salmon run size is above the critical threshold, the base catch ceiling will be 130,000 chum salmon, plus 46,000 chum salmon of the accumulated historical difference, plus any shortfall of up to a maximum of 15,000 chum salmon generated from a failure to capture the preceding non-critical year's base catch ceiling, minus any amortized overage adjustment caused by a prior year's overage of that year's total harvest ceiling.*
- d) *It is also the intent of the Parties to avoid future accumulations. Therefore any annual shortfall below the base catch ceiling of 130,000 chum salmon shall be limited to a maximum of 15,000 chum salmon and shall be added to the next available non-critical season's base ceiling. If it is not taken in that fishery, it shall be foregone.*

- e) *Adjustments due to past overages shall not be limited, but they may be amortized over subsequent years, up to and including 2008.*
- f) *When the chum salmon run size is below the critical threshold, no shortfalls may be accrued; however, any overages shall be carried forward as indicated above.*

The 2006 Annex specified a default total annual catch ceiling which was the sum of a base catch ceiling of 130,000, plus an amortized historical accumulated difference of 46,000 plus a amount of up to 15,000 if the previous year's base catch was not met. It also specified that the amortized historical accumulated difference and the 15,000 carryover, if not taken, would be foregone. For 2006, the U.S. catch ceiling for Areas 7 and 7A was 191,000.

In 2006, the U.S. commercial fisheries in Area 7 and 7A commenced on October 10th and continued through the balance of the season (Table 12 and 13). These fisheries were managed to avoid the capture of non-targeted species. These fisheries did not need further modification based on the status of the Fraser River abundance.

2.12 Paragraph 12:

In the years 2006 through 2008, the United States shall conduct its chum salmon fishery in the Strait of Juan de Fuca (United States Areas 4B, 5, and 6C) so as to maintain the limited effort nature of this fishery, and, to the extent practicable, not increase interceptions of Canadian origin chum salmon. The United States shall continue to monitor this fishery to determine if recent catch levels indicate an increasing level of interception.

This fishery has continued to be restricted to gillnet gear only and to treaty Indian fishers from four tribes. The technical committee has not specifically addressed interception estimates during the 1994 through 2005 time period, or the issue of "minimizing increased interceptions" in 2006, primarily because of extremely low level of harvest. However, GSI samples collected from this fishery in prior years indicate the majority of the catch is chum salmon of U.S. origin, and the total catch and effort in this fishery has declined significantly in recent years (see Table 10). Therefore, interceptions have likely decreased as well.

2.13 Paragraph 13:

All information concerning by-catch of other salmon species from the chum salmon fisheries covered by this chapter will be shared between the Parties in the annual Post Season Report.

By-catch species were reported in the annual post season reports of the Parties.

3. CANADIAN INSIDE CHUM

3.1 Introduction

Southern B.C. chum salmon stocks and fishing areas (Attachment 2) are, for the purposes of management, analysis and reporting, divided into three major components. The stocks of Johnstone and Georgia straits and the Fraser River are described as Inside chum. The primary fisheries of concern for 2006 are the Johnstone and Georgia Straits and the Fraser River.

3.2 Status of Treaty Requirements

A bilateral agreement for sharing of chum salmon was reached on June 30, 1999. Canada and the U.S. agreed to implement, without any prejudice to future agreements, the most recently expired sharing arrangement as outlined in Chapter 6 of Annex IV of the Pacific Salmon Treaty. Canada implemented a significant change in Southern B.C. chum management beginning in 2002, replacing the "Clockwork" stepped exploitation rates in favor of a fixed fishing schedule designed to approximate a total harvest rate of 20%. As a result of this change, guidance was provided by the Commission in 2004 (Attachment 2) pertaining to the management of the Inside chum fisheries. The purpose of this document was to provide Commission direction to the Southern Panel on the conduct of southern chum salmon fisheries for the years 2004 to 2008. This direction was not intended to replace Annex IV, Chapter 6 of the Pacific Salmon Treaty but was to be used on an interim basis.

3.3 Conservation and Harvest Management Requirements

Inside chum are managed with the long-term objective of providing maximum benefits to the fishing industry. The general approach adopted by Fisheries and Oceans Canada (CDFO) is to achieve the present target wild escapements, while augmenting production through enhancement of selected stocks. In practice, this approach is achieved through the application, in mixed stock fishery areas, of harvest rates which are compatible with wild or natural stock productivity. If there are stocks which return to their area of origin in numbers above that area's escapement goal, they may be subjected to additional harvesting in the appropriate terminal area.

The following describes the harvest strategy, Pacific Salmon Treaty (PST) requirements for Inside chum and discusses Inside (Johnstone Strait, Fraser River, and mid Vancouver Island/Georgia Strait) chum stocks in relation to these plans.

3.3.1 Harvest Strategy for Johnstone Strait

The Clockwork strategy in use from 1983 to 2001 was described in the Final 1985 Post Season Summary Report of the Joint Chum Technical Committee (TCCHUM 87-4). The Clockwork strategy was designed to rebuild wild chum stocks to the estimated optimum escapement levels by limiting the overall harvest rate. Ryall *et al.* 1999 (Canadian Stock Assessment Secretariat Research Document 99/169), provided an assessment of the effectiveness of the Clockwork strategy. The Clockwork management strategy required accurate estimates of catch and escapement and the reliability of this strategy depended upon the quality of these data. During the time period in which Inside chum stocks were managed by the Clockwork strategy, the high variability in chum returns, the inadequate escapement coverage, and highly unstable fishing opportunities demonstrated a need to move to an alternative approach.

Following extensive technical reviews and several years of discussions with First Nations, stakeholders and the commercial fishing industry, the stepped exploitation rate approach ("Clockwork" (described in TCCHUM 87-4)) was replaced by a stable fishing schedule designed to approximate a fixed exploitation rate (~20%). Some of the key objectives of this strategy are to ensure sufficient escapement levels while providing more stable fishing opportunities. The exploitation rate is set at 20% across all harvesters, when abundance is above critical level. Of this 20%, 15% is allocated to the commercial sector, and the remaining five percent is set aside to satisfy Food/Social/Ceremonial (FSC), recreational, test fish requirements and to provide a

buffer to the commercial exploitation. Tagging studies conducted in 2000, 2001 and 2002 helped in the development of this strategy by assessing the migration timing and harvest rate on an available abundance of chum in the Johnstone Strait. The impact of the Johnstone Strait fisheries, Clockwork years (1997–2001) and new approach (2002–2006), on Inside chum stocks are detailed in Table 1.

For 2006, the specific objectives of the fixed exploitation strategy were to:

- a. Continue to rebuild/maintain stocks to the optimum wild escapement objective (defined as 2.5 million wild Inside chum);
- b. Establish a preseason fishing plan to achieve an exploitation rate of 20% on Inside chum;
- c. Stabilize commercial catch to provide opportunities at both low and high abundance levels.

3.3.2 Fraser River Chum Management Strategy

The harvest management plan for Fraser River chum was implemented to provide management goals and fishing limits for the harvest of Fraser River chum in the terminal area.

Historically, the terminal run was further divided into early and late segments with escapement goals and harvest guidelines set independently for each segment. In 1992, the minimum gross escapement goal for the early and late segments was set at 390,000 and 350,000 respectively, including First Nations fishing and test fishing requirements. The plan provided for either escapement goal to be increased in season if the return to the river exceeded the pre-season goal.

For the early chum run, the harvest was not to exceed 10% on a terminal run size in the range of 425,000 to 550,000 and for a terminal run of over 550,000 the harvest rate was increased to 15%. For the late chum run, the harvest was not to exceed 10% of a terminal run size in the range of 385,000 to 500,000 and for a terminal run of over 500,000 the harvest rate was increased to 15%. This allowed an upward scaling of the escapement goal with an increase in the run size.

In 1999, the escapement goal (following two recommendations from PSARC, 1992 and 1999) was increased to 800,000 and the early and late run escapements were increased proportionately. There have been ongoing discussions regarding the validity of managing the run based on early and late components; there is little current documentation to support the concept. Since 2002, the Fraser run has been managed on the basis that it is a single aggregate. While evidence for bimodality of run timing was evident in the past at the Cottonwood test fishery and from run timing into individual systems, this characteristic has never been detected in the Albion test catches from which in-season run size estimates are derived.

Table 1. Assessment of Clockwork and the current Johnstone Strait Chum Management 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
PRE-SEASON										
Forecast	Above Average	Above Average	Below Average	Below Average	Below Average	Average to Above Average	Below Average	Average	Average to Above Average	Average to Above Average
POST-SEASON										
Inside Area Abundance ¹	2,642,892	7,543,551	3,729,256	1,267,190	4,844,428	5,019,279	3,595,389	5,386,822	2,941,663	4,005,693
Inside Area Catch	393,066	2,640,459	226,855	257,331	655,650	1,528,482	1,380,380	1,813,277	1,120,368	1,527,359
Estimated Harvest rate	14.9%	35.0%	6.1%	20.3%	13.5%	30.5%	38.4%	33.7%	38.1%	38.1%
Johnstone Strait (JS) Catch										
Commercial Areas 11-13 ²	88,091	1,567,736	38,002	176,980	209,918	668,936	877,746	1,175,883	856,029	859,201
First Nations Areas 11-13	17,075	2,479	11,736	14,899	23,562	17,131	10,482	20,087	9,595	14,242
Johnstone Total	105,166	1,570,215	49,738	191,879	233,480	613,215	959,141	1,195,970	865,624	873,443
Target Harvest Rate ³	10%	40%	20%	10%	20%	20%	20%	20%	20%	20%
Estimated Harvest Rate	4.0%	20.8%	1.3%	15.1%	4.8%	13.7%	26.7%	22.2%	29.4%	21.8%
ESCAPEMENT (includes wild and enhanced)										
	2,249,826	4,903,092	3,502,401	1,009,858	4,188,778	3,490,797	2,215,009	3,573,545	1,821,295	2,478,334

(1) Total Inside Area stock includes total Inside Area catch plus escapement. Total Inside Area catch includes all Inside Area catches (Inside Area catch composition based on historic GSI for all fisheries).

(2) Includes commercial and test fishery catches

(3) Desired harvest rate pre 2002 based on Clockwork management strategy. Desired harvest rates post-2001 are based on 20% fixed harvest rate approach.

3.3.2.1 Fraser River Management Rules

Table 2 provides a summary of key decisions for the management of the Fraser River chum fishery.

Table 2. Key decision points for Fraser River chum.

Run Size	Harvest Plan	First Nations	Commercial	Recreational
<800,000 in Fraser	<10%	Limited (Reduced hours and days / week fishing)	Closed	Restricted openings
800,000–916,000 in Fraser	Catch not to exceed 81,000 (72,000 First Nations and 9,000 test fishing)	Normal (72,000)	Closed	Tributary openings
916,000–1,050,000 in Fraser	Commercial catch not to exceed 10% for chum.	Normal (72,000)	Open (35,000–105,000)	Open
>1,050,000 in Fraser	Commercial catch not to exceed 15% for chum.	Normal (72,000)	Open	Open

The following additional decision guidelines apply to the management of the Area 29 chum fishery:

Rule 1. Directed harvest will not occur unless the run size estimate derived from cumulative test fishing catches predicts that the abundance of chum exceeds the gross escapement goal. For computational purposes, a commercial fishery within the river will be considered to harvest a minimum of 35,000 chum. The harvest rate schedule (Table 2) will be used to determine the available surplus.

Rule 2. Albion test fishing data will be used to determine the timing of commercial openings. In 2002, a Bayesian based, run size estimation model was adopted. Test fishing data from September 1 to October 20 is required to establish the estimated run size. Since 1998, the test fishery has operated on alternate days to reduce coho by-catch.

Rule 3. The standard openings for directed commercial chum harvesting will be inside the river (Sub-areas 29–11 through 29–17).

Rule 4. The daily commercial chum openings will be structured to avoid night fishing.

Rule 5. Whenever practical, 24 hours notice will be given for openings; however, shorter notice may sometimes be required. Notices to Industry, advising of run status and possible management actions will be issued when appropriate.

Rule 6. The minimum mesh size of 158 mm (approximately 6.25 inches) has been in effect since 1995.

Rule 7. Area E license conditions include: fish slips, observers, logbooks, hails, revival tanks, etc. Inseason advisors will be updated on current status through conference calls.

Rule 8. Conservation of Thompson River coho became a major issue in 1997 and will likely remain so for the foreseeable future. Fishing restrictions between August 29 and October 15 in Area 29 can be anticipated. Conservation of Thompson and Chilcotin River steelhead will result in fishing restrictions in later October and possibly early November. Potential low returns of Harrison River Chinook are also a consideration if earlier fisheries are proposed.

Rule 9. The B.C. Ministry of Water, Lands and Air Protection (MWLAP) has used Albion test fishing data to estimate abundance of Interior Fraser steelhead. Fishing related mortality is estimated with a steelhead harvest model the MWLAP also developed. Conservation measures during in-river fisheries are discussed with CDFO. Commercial fisheries are not allowed before late October to protect Interior Fraser steelhead. Exact timing of commercial and First Nations net fisheries were finalized following discussions with provincial staff.

3.3.2.2 Fraser River Inseason Run Size Estimation

A test fishery has operated at Albion on the Fraser River since 1978 to provide the means for an index of chum salmon abundance (escapement) within a season. Recent degradation of the accuracy and consistency of escapement estimates has seriously undermined the potential to evaluate Clockwork management for the Fraser River chum salmon (PSARC paper S99-20, Ryall *et al.* 1999). To address this problem the cumulative catch-per-unit-effort (CPUE) was calculated to account for saturation, depletion in the second set and interpolation for missing sampling days. In addition, the test fishery data were cast into a Bayesian framework that incorporated preseason knowledge of run size and migration timing, with inseason information on migration timing and a predictive regression to calibrate run size to the historical record. Based on a retrospective analysis of 1979–1998 data, the Bayesian procedure was judged superior to the classical test fisheries approach of using a simple predictive regression of cumulative CPUE on run size (Gazey and Palermo, 2000). However, the predictive ability of both models was seriously compromised by the reliability of escapement enumeration. The new Bayesian procedure for estimating inseason Fraser River chum run size has been in use since the 2000 fishing season.

In 2006, estimates of Fraser River total run size were made from test fishing conducted within the Fraser River between September 1 and November 23 (inclusive).

3.3.3 Strait of Georgia Chum Management Strategy

Chum stocks returning to the terminal areas are directly affected by the harvest in Johnstone Strait. A portion of this return is harvested in Johnstone Strait. Chum returning to mid Vancouver Island (Area 14) are primarily from enhancement facilities. Terminal harvesting is

directed at a mix of surplus mid Vancouver Island wild and enhanced chum, with the conservation requirements of passing chum stocks considered. Conservation requirements of local Chinook and coho salmon in this fishery area are also considered in determination of area closures for the Area 14 chum fishery.

Terminal surpluses were estimated from escapement, test and commercial harvesting. Areas for potential terminal fishing in the Strait of Georgia occur at mid Vancouver Island (Area 14), Jervis Inlet (Area 16), Nanaimo (Area 17) and Cowichan (Area 18). Terminal area harvests occurred when surpluses were identified.

3.4 Planning, Implementation and Post Season Review

3.4.1 Preseason Planning

For 2006, there was no formal forecast provided for Inside chum. A stock status outlook was provided taking into account brood year performances and trends in recent marine survival indices. Returns in the main brood component were above average in 2002. For 2006, the outlook for Inside chum was for an average to above average return abundance.

Prior to the season, a preseason commercial fishing plan was established through consultation with commercial user groups. Each plan was designed to achieve the 20% target based on the specific gears estimated daily harvest rate at an anticipated effort level.

3.4.2 Inseason Implementation

There were no Johnstone Strait chum test fisheries in 2006 due to the Laroque court decision in Canada. These test fisheries played an important role in establishing run timing, relative abundance, and stock structure information. Without that tool available there would be increased uncertainty around the post season evaluation of the targeted chum exploitation in Johnstone Strait.

In 2006, Competitive seine, troll and gill net fisheries were conducted based on the preseason plan. Modifications to the gill net and troll plan were made to account for variation in effort participation compared to the pre-season expectations. Table 3 outlines the duration of fishery openings during the 2006 season.

Table 3. Johnstone Strait chum commercial openings 2006 (hours open).

Year	Statistical Week	Statistical Area					
		12			13		
		Seine	Gillnet	Troll	Seine	Gillnet	Troll
2006	10-1	12	41	96	12	41	96
	10-2		41	72		41	72
	10-3		63	48		63	48
	10-4	10			10		
2006 Total		22	123	219	22	123	219

3.4.3 Post Season Review

The total chum catch in all Inside Areas (including the catch of Canadian chum in U.S. Areas 7 and 7A), plus Inside chum gross escapements were summed to estimate the total Inside chum assessed run size. An evaluation table of Inside chum management goals, stock sizes, catch, escapement, and harvest rates are presented in Table 1.

3.5 Catch/Fishery

Fall chum in Inside waters are harvested by commercial, First Nations, recreational and test fisheries. Commercial catch of chum in Inside waters occurs in three main areas: Johnstone Strait, Strait of Georgia and the Fraser River. Fall chum fisheries generally begin in late September and end in November. In addition, a by-catch of chum may occur in fisheries directed at sockeye and pink. This chum by-catch is assumed to be comprised mainly of summer chum destined for streams in the Johnstone Strait and Canadian central coast areas and is not part of the directed chum fishery management plan. The summer chum catches are presented in Table 4.

Table 4. Catch of chum salmon by statistical area for commercial, research and test fishing vessels (July through the second week of September).

Year	Statistical Week	Statistical Area					Total
		18	19	20	21	29	
1997	7/1-9/2	0	0	409	0	215	624
1998	7/1-9/2	0	0	50	0	46	96
1999	7/1-9/2	0	0	35	0	49	96
2000	7/1-9/2	0	0	37	0	73	110
2001	7/1-9/2	0	0	26	0	77	103
2002	7/1-9/2	0	0	37	0	197	234
2003	7/1-9/2	0	0	27	0	51	79
2004	7/1-9/2	0	0	17	0	534	551
2005	7/1-9/2	0	0	0	0	115	115
2006	7/1-9/2	0	0	52	0	419	471
Area Total		0	0	690	0	1,776	2,479

* Catches do not include PSC test fisheries

3.6 Escapement

Chum that escape the commercial, First Nations, recreational and test fisheries form the gross escapement to Inside chum streams. This gross escapement is made up of chum that spawn in wild areas, those which are spawned in enhancement facilities, and those which are surplus to facility requirements and are removed from the spawning areas. Gross escapement estimates are used in reconstruction of the total run size in a given year.

Some Inside Area streams support summer chum populations. These are relatively minor stocks and because of their distinctively early run timing in Johnstone Strait, *i.e.* July to late August, they are not included in the escapement total for the fall chum run.

The primary enhanced escapement areas are presently limited to the mid Vancouver Island, Squamish River, Burrard Inlet and Fraser River areas. The enhancement facilities in the mid Vancouver Island consist of Big Qualicum, Little Qualicum and Puntledge rivers. There is one enhancement facility in the Burrard Inlet (Capilano River hatchery: limited chum hatchery enhancement), and the Squamish watershed (Tenderfoot creek hatchery) and five in the Fraser River watershed (Inch Creek Hatchery, Chilliwack, Chehalis, and Weaver). The principal use of chum returning to hatcheries in the Lower Fraser and Squamish watersheds is for First Nations Excess Salmon Spawning Requirements (ESSR) fisheries. Enhancement on the Capilano is opportunistic only using chum that return to the hatchery directly for broodstock.

The stocks which are managed within the context of the Inside chum plan are the fall run chum. These chum enter Johnstone Strait during the September to November time period. Escapement estimates, for Inside chum since 1997, are presented in Table 5.

Table 5. Inside chum spawning escapement for wild and enhanced groupings (Fraser and Non-Fraser) for 1997–2006.

Grouping	1997 Estimate	1998 Estimate	1999 Estimate	2000 Estimate	2001 Estimate	2002 Estimate	2003 Estimate	2004 Estimate	2005 Estimate	2006 Estimate
Fraser (Wild + Enhanced)	1,531,958	3,561,042	2,985,452	699,976	3,129,707	2,246,665	1,494,491	2,595,283	1,303,941	1,927,629
Non- Fraser (Wild + Enhanced)	717,868	1,342,050	516,949	309,883	1,059,071	1,244,132	720,518	978,262	517,354	550,705
Total	2,249,826	4,903,092	3,502,401	1,009,859	4,188,778	3,490,797	2,215,009	3,573,545	1,821,295	2,478,334

3.7 2006 Inside Area Fishery Descriptions.

The annual detailed summary is a description of the run size and harvest strategies on a weekly or commercial fishery basis. The description contains run size forecasts, commercial opening times, harvest rate goals, and commercial and First Nations' catches.

Preseason expectations for 2006 indicated an average to above average return for Inside chum salmon stocks.

3.7.1 Johnstone Strait

There were eight competitive commercial chum fisheries in Johnstone Strait in 2006. The first competitive purse seine fishery occurred on October 2nd (12 hours). The catch for this fishery was 423,000 chum. The second competitive fishery occurred on October 3rd–6th (troll 96 hours) and harvested a 26,000 chum. The third fishery on October 5th–7th (gill net 41 hours) harvested 44,000 chum. The next fishery (gillnet 41 hours) on October 10th–12th caught 41,000 chum. The fifth fishery (troll 72 hours) on October 11th–13th harvested 25,000 chum. Another troll fishery

(for 48 hours) occurred on October 16th–17th harvesting an additional 17,000 chum. The last gillnet fishery (for 63 hours) occurred on October 16th–19th and harvested 52,000 chum. The second competitive purse seine opening occurred on October 23rd (10 hours) harvested 232,000 chum.

The total 2006 commercial catch for Johnstone Strait (Areas 12 and 13) was 859,000 chum. There were no directed chum fisheries in terminal areas of Johnstone Strait. In addition, First Nation and recreational catches were estimated at 14,000 and 9,000 chum respectively for the 2006 season.

3.7.2 Strait of Georgia

The Qualicum (Area 14) gillnet openings occurred on October 10th–12th, 16th–19th, 22nd–26th and 29th–31st, November 7th–9th, 15th–17th and 21st–23rd. There was a total of 23 days fished with a catch of approximately 81,000 chum. The troll fishery opened on October 7th and closed on November 17th for a total of 39 days, with a catch of approximately 700 chum. Seine fisheries occurred on November 13th, 15th–17th, 23rd–24th. The seine fishery was open for 5 days with a catch of approximately 3,400.

No commercial fisheries occurred in Jervis (Area 16), Nanaimo (Area 17) or Cowichan (Area 18).

The total chum catch reported by First Nations is approximately 15,000. The majority of this harvest occurred in-river.

The total catch estimated by the creel survey and reported, as Strait of Georgia catch retained is approximately 2,000 (not including Area 13).

3.7.3 Fraser

There were three Area E Gill-net fisheries in the Fraser River, on the following dates: October 23rd (gill net 10 hours); October 30th (gill net 10 hours); and November 9th (gill net 10 hours). Total estimated catches in these fisheries were 61,747, and 81,970, and 19,826, respectively, for a total of approximately 163,543 chum salmon. The First Nation fishery in the lower Fraser River caught 129,900 chum, of which 15,200 were FSC and 114,700 were Economic Opportunity (EO). In 2006, estimates of Fraser River terminal run size were made from test fishing conducted within the Fraser River (at Albion) between September 1st and November 23rd (inclusive). The final post-season Fraser River terminal run size estimate at Albion (based on Fraser River chum test fishery data) was calculated to be 2.485 million.

4. WEST COAST VANCOUVER ISLAND CHUM

4.1 Conservation and Harvest Management Requirements.

Chum salmon stocks return to all Statistical areas (Attachment 2) on the west coast of Vancouver Island (WCVI). The most significant WCVI group of stocks is the Nitinat group (Area 22) which includes a major hatchery on the Nitinat River. The net spawning escapement

requirement for the Nitinat system totals 175,000, including 150,000 into the Nitinat River and 25,000 into other tributaries. Additional requirements for hatchery and test fishing may total up to 75,000. Therefore, the gross escapement requirement is 250,000 chum.

The management of this fishery is based on achieving the gross escapement requirement of 250,000 into the Nitinat watershed. Weekly escapement targets are set to ensure that all timing components of the run are represented. Weekly fisheries are scheduled in Area 21 and surrounding waters to harvest any identified surplus.

The fishing plan was based on providing early opportunities for gill net followed by a seine fishery to balance allocation and then a seine/gill net fishery at the peak of the run. Fisheries are dependent on reaching weekly escapement milestone levels into Nitinat Lake. Early season opportunities are constrained by concerns over Thompson River steelhead by-catch.

Gill net and seine vessels take part in the Nitinat area fishery. A gill net in-lake assessment fishery begins in late September. If weekly escapement targets are achieved and a further surplus is identified, then seines are allowed. Subsequent fisheries may open to both gear types, depending on achievement of the weekly escapement targets. A gill net test vessel, along with visual surveys of the river, is used to determine escapement into Nitinat Lake.

Since 1995, bycatch concerns at Nitinat have been addressed by delayed opening dates, reduced fishing area, increased use of weed lines, and species selective fishing techniques. In 1998, to minimize encounters of passing stocks of coho and Interior Fraser River steelhead, the first commercial gill net fishery was delayed until the beginning of October. In addition, the initial fishing area was reduced to within a one-mile boundary between lines true south from Pachena and Dare Points, based on information from the gill net test fishery. To reduce mortality of coho and steelhead and to improve the quality of catch data, the following measures were implemented for the entire season:

- non-retention of coho and steelhead (seine and gill net)
- mandatory functional revival tanks (seine and gill net)
- daylight fishing only (gill net)
- onboard observers (portions of seine and gill net fleet)
- logbooks and weekly hail-ins (seine and gill net)
- two-meter weed line for gill nets

In 2006, all measures continued to be implemented with the exception of on-board observers.

4.2 Catch, Escapement, and Run Size

Catch in Nitinat (Area 21) has traditionally occurred by gill net and seine (Table 6) outside the lake in marine areas. In the past, catch of non West Coast chum has occurred in the outside seaward portion of the fishing area. Management actions have been implemented to reduce this catch by restricting harvest closer to the terminal area. More recently, First Nations' harvests occurred within the lake (Area 22). Escapements of natural spawners have varied over the years (1997–2006) from a high of 435,000 to a low of 22,000.

Pre-season forecasts were based on escapement, survival of each year class and previous years' environmental factors. The pre-season forecast for 2006 return to Nitinat was 980,000 chum salmon.

Table 6. Nitinat area catch and escapement 1997–2006 (Areas 21 and 22).

Year	Area 21		Area 22	
	Seine Catch	Gillnet Catch	In-lake Catch & Broodstock	Natural Spawners
1996	268,000	75,000	122,000	343,000
1997	831,000	218,000	254,000	435,000
1998	537,000	157,000	410,000	192,000
1999	12,000	85,000	89,000	153,000
2000	2,000	7,000	11,000	22,000
2001	89,000	75,000	178,000	303,000
2002	466,000	81,000	383,000	40,000
2003	265,000	190,000	78,000	243,000
2004	72,000	156,000	166,000	250,000
2005	385,000	294,000	237,000	310,000
2006	224,000	230,000	145,000	135,000
Average	286,000	143,000	188,000	221,000

Commercial gillnet fisheries commenced in Area 21 Nitinat on October 1st. There were 17 days of gill net fishing with the last day of fishing occurring on the 26th of November. Fleet size during the first three weeks of the fishery averaged 80 vessels per day. As expected the fleet size declined after the October 19th & 20th seine fisheries. The in season catch estimate for Area E gill nets in Area 21 was approximately 227,000 chum salmon. A total of 4 days were fished by seine gear (October 19th, 20th, 23rd and 24th) in Area 21/12. The catch estimate for seine was approximately 224,000 chum. The majority of the seine harvest (204,000) occurred during the October 19th and 20th openings.

Weekly gillnet fisheries commenced in Area 25 on September 19th. There were 8 days of gill net fishing over the following 6 weeks in Outer Nootka Sound and Esperanza Inlet. Tlupana Inlet was open for 2 days of gill net fishing in 2006. The last day of gill net fishing occurred on the 24th of November. The gillnet catch is estimate at 125,000.

A limited effort commercial fishery occurred in Barkley Sound (Area 23) starting on September 25th and ended on October 25th for 2 days per week. This gillnet fishery was limited to 8 vessels per week and caught a total of approximately 18,000 chum.

The total catch reported by First Nations (Area 21, Nitinat Lake) was approximately 16,000 chum. The recreational anglers catch is estimated to be less than 100 chum, predominately from in-river fishing.

5. UNITED STATES STOCKS AND FISHERIES

5.1 Washington Run Sizes, Catches, and Spawning Escapements

Tables 7 through 9 provide the pre-season forecasts of run size, post-season estimates of spawning escapement and the total run size for the various chum salmon runs returning to Puget Sound and Coastal Washington areas. The tables provide estimates for three major groupings which are defined by their return timings (summer, fall, and winter chum). Table 10 provides chum catch information from the Strait of Juan de Fuca (SJF) fisheries—Areas 4B, 5, and 6C and the San Juan Islands/Point Roberts (SJI/PR) fisheries—Areas 7 and 7A (*see*—Attachment 2). The table also includes annual chum harvest totals for the Puget Sound and the Washington Coastal areas.

Paragraph 10 of the Chum Annex requires that Canada and the United States assess catch levels of summer chum salmon caught during the August 1 through September 15 time-period in boundary area fisheries. Table 11 provides chum catch during the summer chum management period for U.S. boundary area fisheries.

Table 7. Washington summer chum salmon pre-season and post-season estimates of abundance and estimated spawning escapements (1997–2006).

Region	Type	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Strait of Juan de Fuca	Pre-Season	1,338	1,310	869	792	941	1,468	3,131	4,739	6,803	8,238
	Post-Season	985	1,316	577	987	3,982	6,981	7,016	9,360	9,734	8,281
	Escapement	962	1,269	573	983	3,955	6,955	6,959	9,341	9,682	8,246
Hood Canal	Pre-Season	10,823	10,856	6,742	6,988	6,871	7,846	10,128	18,078	18,060	19,780
	Post-Season	9,373	4,274	4,527	9,506	13,375	13,170	36,024	95,077	16,165	29,395
	Escapement	8,972	4,001	4,114	8,649	12,044	11,454	35,696	69,995	15,757	26,753
South Puget Sound ¹	Pre-Season	69,634	149,950	121,039	84,867	75,599	155,000	47,788	99,317	38,334	55,300
	Post-Season	16,697	87,504	23,545	39,028	84,111	58,545	49,817	178,199	44,993	78,797
	Escapement	16,001	80,404	23,461	27,705	62,821	46,798	45,945	120,782	24,701	63,345

¹South Puget Sound estimates include only commercial catch and escapement within Puget Sound.

Table 8. Washington fall chum salmon pre-season and post-season estimates of abundance and estimated spawning escapements (1997–2006).

Region	Type	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Willapa Bay	Pre-Season	25,500	35,000	78,010	69,188	79,892	79,892	75,817	45,352	38,038	37,854
	Post-Season	34,112	76,714	26,409	46,991	53,384	92,334	85,283	32,022	28,275	23,137
	Escapement	33,286	65,092	24,751	40,030	29,623	59,750	47,347	17,115	11,924	14,907
Grays Harbor	Pre-Season	27,138	13,370	46,400	32,000	21,182	35,773	42,064	79,183	63,441	29,370
	Post-Season	14,071	37,161	15,198	10,432	26,049	39,997	48,652	103,658	20,397	15,786
	Escapement	13,456	35,188	12,260	8,942	24,898	31,405	37,947	73,828	13,058	11,268
Strait of Juan de Fuca	Pre-Season	4,720	3,130	3,029	2,823	1,841	1,761	2,494	2,438	3,460	3,830
	Post-Season	3,927	1,535	1,313	269	1,737	5,198	1,177	3,237	2,382	1,567
	Escapement	3,780	1,419	1,272	219	1,562	4,603	1,071	2,739	2,034	1,313
Nooksack / Samish	Pre-Season	51,122	82,000	25,378	95,598	95,598	171,000	81,921	78,484	126,869	135,100
	Post-Season	55,000	149,600	94,000	18,878	131,412	109,591	133,464	89,850	64,496	66,605
	Escapement	22,222	89,206	34,594	5,244	75,919	86,284	112,683	53,563	44,512	29,289
Skagit	Pre-Season	62,418	186,000	59,345	168,000	45,000	304,049	52,410	109,715	25,695	164,094
	Post-Season	17,544	148,970	50,393	41,393	98,617	410,293	37,209	171,185	53,684	213,476
	Escapement	14,392	121,500	36,767	22,377	73,368	210,028	18,017	150,196	34,600	105,239
Stillaguamish / Snohomish	Pre-Season	244,707	338,331	151,012	184,867	113,600	685,100	245,246	264,542	225,113	445,800
	Post-Season	28,500	352,800	123,100	56,093	361,347	689,850	214,565	382,825	84,821	479,927
	Escapement	20,066	243,991	91,091	39,050	85,119	377,481	172,354	212,463	38,787	272,925
South Puget Sound	Pre-Season	380,111	500,000	662,000	402,000	214,000	241,500	448,365	470,048	655,742	466,700
	Post-Season	130,700	682,700	234,500	234,976	940,776	955,726	753,706	1,023,908	412,820	927,676
	Escapement	85,951	430,589	163,403	105,857	313,570	320,817	316,816	356,712	136,552	354,587
Hood Canal	Pre-Season	528,823	662,659	1,158,571	624,623	299,944	446,616	342,061	501,100	749,593	668,400
	Post-Season	456,000	575,300	147,300	153,346	793,359	898,754	1,272,657	1,194,733	345,701	776,450
	Escapement	125,302	244,354	87,095	62,931	255,371	370,840	333,118	231,758	98,761	187,358

Table 9. Washington winter chum salmon pre-season and post-season estimates of abundance and estimated spawning escapements (1997–2006)

Region	Type	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
South Puget Sound	Pre-Season	82,900	36,748	51,973	33,568	54,631	11,700	34,575	76,464	142,406	149,200
	Post-Season	13,099	77,885	17,579	11,323	158,380	219,205	53,507	134,003	72,739	75,833
	Escapement	9,271	76,676	15,691	8,524	139,046	206,468	50,050	98,579	43,917	58,785

Table 10. Catch of summer, fall, and winter chum salmon in SJF, SJL/PR, Puget Sound and Washington coastal areas (1997–2006).

Region	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
SJF	30,802	18,577	7,190	5,621	10,209	1,554	734	5,994	11,560	4,461
SJL/PR	248	40,939	79	433	3,247	111,976	81,613	166,170	77,536	105,838
Puget Sound ¹	385,311	752,685	236,235	280,506	1,457,426	1,837,633	1,469,146	1,936,236	645,420	1,536,071
WA Coast ²	3,106	29,911	12,552	23,333	26,383	41,642	49,738	47,500	23,811	13,341
Total	419,467	842,112	256,056	309,893	1,497,265	1,992,805	1,601,250	2,155,900	758,381	1,659,711

¹All other Puget Sound freshwater and marine catch reporting areas except Strait of Juan de Fuca or San Juan Islands Fisheries.

²Coastal Areas combine Catch and Reporting Areas 1–4 including Grays Harbor, Willapa Bay, and Columbia River.

Table 11. Catch of chum salmon in the Strait of Juan de Fuca and the San Juan Islands' commercial fisheries during the summer chum accounting period.

Periods:	7/1–8/11 ¹	8/12–8/18	8/19–8/25	8/26–9/1	9/2–9/8	9/9–9/15
95–97 GSI ²	0.68	0.68	0.397	0.45	0.14	0.07
1997	41	4	7	0	7	54
1998	44	16	1	0	0	0
1999	7	0	0	0	0	0
2000	11	2	0	0	0	0
2001	29	0	0	0	0	0
2002	44	0	0	0	0	0
2003	219	110	70	0	0	15
2004	149	15	0	15	31	25
2005	11	18	17	17	3	34
2006	38	61	51	10	28	3

¹Indicates cumulative catch through this period.

²Proportion of Hood Canal/Strait of Juan de Fuca summer chum from GSI samples from 1995–1997.

5.2 United States Strait of Juan de Fuca Fisheries (Areas 4B, 5, 6C)

5.2.1 Management Intent

During the 2006 season the management strategy for the Strait of Juan de Fuca fishery has consisted of limiting the total effort in this fishery and keying management decisions on the needs of Puget Sound stocks of chum salmon. The regime of this fishery has been maintained by limiting access to four Treaty Indian tribes using only gillnet gear.

This fishery has been constrained by low catch rates, low market prices, and inclement weather conditions, resulting in relatively modest catch levels, which have had a decreasing trend over the period of 1997–2006 (Table 10). The catch in 2006 increased relative to recent years, however, catch and effort were still below historical levels.

5.2.2 2006 Fishery Description

As in previous years, the chum fishery in Areas 4B, 5, 6C was restricted to Treaty Indian gill net gear only. The fall chum fishery opened the week of October 15 and remained open 7 days per week through November 11.

Incidental catches of chum salmon occurred in commercial and test fisheries for other species prior to the fall timed chum management period. A total of 155 chum salmon were taken prior to September 16 (during the summer chum accounting period) (Table 11). An additional 5 chum were harvested incidental to coho fisheries prior to the fall timed chum management period. There were 4,301 chum salmon harvested in chum fisheries after October 10; the total chum catch for 2006 was 4,461 (Tables 10 and 11).

5.3 San Juan Islands / Point Roberts Fisheries (Areas 7 and 7A)

5.3.1 Management Intent

The U.S. fishery in Areas 7 and 7A was managed pursuant to the Commission guidance to the Southern Panel on the Management of Southern Chum Fisheries, (Attachment 2), which was a provisional modification to Annex IV, Chapter 6 Chum Annex) of the PST. The purpose of the document was to provide Commission direction to the Southern Panel on the conduct of southern chum salmon fisheries for the years 2004 to 2008. This direction was not intended to replace Annex IV, Chapter 6 of the Pacific Salmon Treaty. Additionally, the guidance document outlined certain modifications to the limits for the U.S. chum salmon fishery in Areas 7 and 7A, which disconnected the U.S. harvest limits from the harvest levels in the Johnstone Strait fishery. In summary, the guidance provided for the harvest limit of 130,000 chum salmon, unless Canada indicated that a critically low abundance condition was evident. The guidance document provided conditional actions in U.S. Areas 7 and 7A fisheries and reiterated a consistency with Chapter 6, provision 3(a)(ii) of the Annex identifying a catch ceiling of 20,000 given pre-season critical abundance.

The guidance document also included U.S. catch compensation due to the U.S. for harvest shortfalls from prior years, with the intent to eliminate the total accumulated catch difference by 2008. Consistent with Annex IV, Chapter 6, paragraph 5, the difference between actual catches and catch levels specified by this chapter is a total historical accumulated difference of 228,300 chum salmon, (accumulated from 1991 through 2003); the difference will be amortized over the years of the agreement described in the guidance. In 2006 the adjustment amount was 46,000 (Table 12).

The guidance document also provided that U.S. fisheries, for chum salmon, may start in these areas no earlier than October 10. It also provided for management responses in the U.S. Areas 7 and 7A fisheries, when inseason estimates indicated a low abundance (less than 900,000 fish) entering the Fraser River.

Table 12. Summary of U.S. Areas 7 and 7A limits and catches in 2006. The adjusted catch limit includes a portion (46,000) of the amount that was due to the U.S.

Year	PSC Guidance Specified Limit	Adjusted Limit ^{1,2}	Actual Catch	Annual Overage or Shortfall	Accumulated Balance Remaining	Total Accumulated Balance Plus Shortfall Due
2003			81,613	0	228,300 ¹	228,300
2004	130,000	176,000 ¹	166,170	0	182,300	182,300
2005	130,000	176,000 ¹	77,536	15,000 ²	136,300	151,300
2006	130,000	191,000 ^{1,2}	105,838	15,000 ²	90,300	105,300

¹The adjusted catch limit includes a portion (46,000) of the amount that was due to the U.S. That amount is subtracted from the total accumulated difference, whether actually harvested or not.

²This value is identified in the Commission's guidance document to the Southern Panel (Attachment 2).

Paragraph 3 of the Chum Annex also provides for the U.S. to manage its fishery to maintain a traditional proportion of the catch between Areas 7 and 7A and to avoid concentrations of effort along the international boundary in Area 7A. There have been only five years with a significant fishery during this time-period and the percentage of the catch in Area 7A ranged from 23.8% to 53.4% (Table 13). Historically, the catch had been distributed approximately 50/50 between the two areas.

Table 13. Distribution of catch between areas 7 and 7A (1997–2006).

Catch Area	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
7	97	30,913	0	430	2,241	69,475	39,990	77,412	56,904	64,907
7A	151	9,634	79	2	1,006	42,501	41,642	88,758	20,632	40,931
% in 7A	*	23.8%	*	*	*	38.0%	51.0%	53.4%	26.6%	38.7%

*Non-fishing years; primarily incidental catches.

5.3.2 2006 Fishery Description

Preseason forecasts were for a good return of fall chum in Puget Sound. Inseason updates of abundance indicated that numerous runs were significantly more abundant than the preseason forecast. The harvest level for Areas 7 and 7A, as specified in the 2004 agreement (Commission guidance to the Southern Panel on the management of southern chum fisheries [February 13, 2004], Attachment 2), was 130,000 chum salmon plus an adjustment of 46,000 chum salmon from previous U.S. harvest shortfalls for a total target catch of 176,000 chum salmon. No specific forecast or inseason abundance estimates were available for overall Canadian Inside chum stock but Canada indicated the run size was not at a critically low level. The abundance below the critical threshold was not identified by Canada in 2006 and under the terms of the guidance, fisheries proceeded as planned.

Non-Treaty reef net fisheries continued after the end of Fraser Panel control and fished through the chum management period through November 11. After the Panel's release of control for this area and prior to October 1, this fishery required the release of all Chinook, sockeye, chum, and unmarked coho. After October 1, retention of chum and marked coho were allowed. For the

week beginning October 8, the Treaty Indian gill net and purse seine fishery was opened for 39 hours on October 10–11 with an area restriction in Haro Strait (Area 7) between Mitchell Bay and Lime Kiln for coho conservation. The Non-Treaty gill net and purse seine (Chinook and coho release) fishery followed with three days October 12, 13, and 14. Non-Treaty gill nets were open continuously through November 11, Chinook and coho release.

For the week beginning October 15, the Treaty Indian gill net and purse seine fishery was open for three days from October 15 through October 17 with the Haro Strait area restriction removed. The Treaty fishery reopened on October 21 after the Non-Treaty fishery. The Non-Treaty gill net and purse seine (Chinook and coho release) fishery was open three days from October 18, 19, and 20 with coho and Chinook release.

For the week of October 22 the Treaty Indian gill net and purse seine fishery continued open on October 25 and remained open until the end of November 11. The Non-Treaty gill net and purse seine (Chinook and coho release) fishery opened three days on October 25, 26, and 27 with coho and Chinook release.

For the weeks of October 29 and November 5, the Non-Treaty gill net and purse seine (Chinook and coho release) fishery opened five days a week; October 30 through November 3 and November 6 through November 10, with coho and Chinook release.

For the week of November 12 The Treaty Indian gill and purse seine fishery opened again November 15 and remained open until November 30.

Catches during first week of the chum fishery were less than expected (35,519) given the U.S. share, but increased the second week (47,879), but dropped off after the third week of the fishery (13,228). Most fishing effort decreased by the fourth (5,884) and fifth weeks (1,105) of the fishery. Despite Chum prices improving, large abundances of chum were not in evidence in 7 and 7A, and resulted in the fishery falling short of its catch ceiling in 2006 by 45% (Table 12).

There were 36 summer timed chum reported caught in Areas 7 and 7A prior to September 16. These fish were caught incidental to sockeye fisheries. There were 2,103 chum harvest during the September 16 to October 10 time period. Catch during the chum directed fishery totaled 103,699. The total chum catch by all gears in Areas 7 and 7A was 105,838.

6. STOCK IDENTIFICATION

6.1. Tagging of Adult Chum Salmon

No adult tagging projects were reported by either United States or Canada in marine or near shore areas in 2006.

6.2 Coded Wire Tagging, Otolith and Fin Marking

United States

A summer chum salmon supplementation program was started in 1992 at the Quilcene National Fish Hatchery to address severe declines in the numbers of summer chum returning to the Quilcene River and Hood Canal. The first brood (1992) was coded wire tagged to evaluate summer chum returns and fishery distributions in marine fisheries. Concerns over the physical impacts of tagging small fish, and limited sampling for tags in chum fisheries, led to the discontinuation of the CWT effort. In recent years, an adipose-only clip was utilized to aid in identifying hatchery fish for terminal fisheries management and project evaluation purposes. Brood year 2003 was the final year summer chum were marked and released from the hatchery.

A number of other hatchery supplementation and reintroduction programs for summer chum in the Hood Canal and Strait of Juan de Fuca regions, and fall chum in the Lower Columbia have utilized otolith marks to aid in assessing the success of the programs and to determine the proportion of hatchery and natural origin fish on the spawning grounds (Table 14). Supplementation summer chum releases for recovery ended at Discovery, Chimacum, and Union with brood year 2003.

Table 14. Numbers of summer and fall chum salmon released with otolith marks, by brood year and location (2000–2006).

Brood Year	Puget Sound Summer Chum							
	Sequim	Discovery Bay ¹	Chimacum ¹	Big Beef	Hamma Hamma	Lilliwaup	Union ¹	Tahuya
2000	25,900	90,435	73,300	80,550	55,400	14,800	75,876	
2001	54,515	90,980	79,500	80,925	49,500	38,000	73,472	
2002	20,887	118,347	57,300	72,622	61,000	96,000	82,636	
2003	49,897	88,610	57,435	76,353	75,356	103,913	35,343	111,232
2004	76,982			14,814	57,000	99,500		118,872
2005	57,300			5,685	117,837	106,466		119,260
2006	79,428				151,550	88,800		133,826
	Lower Columbia River Fall Chum							
	Gruys River Hatchery		Sea Resources Hatchery		Washougal Hatchery			
2000	202,833		74,512					
2001	305,185		0					
2002	398,000		84,818		218,283			
2003	357,000		102,132		75,952			
2004	163,000		0		0			
2005	155,501		0		19,578			
2006	129,427							

¹Program discontinued after brood year 2003.

Canada

Thermal marking has been used as a technique of mass marking hatchery raised salmonids in B.C. since 1992. The method involves manipulating the temperature of the rearing water by at least 2°C to induce a mark on the otolith. The change in water temperature can be accomplished through the use of two different water sources, through heating the water or by chilling it. By

altering water temperatures over a period of time a unique mark can be created. Thermal marking was first used on chum from Nitinat hatchery in 1993 and continues to be used as a means of estimating hatchery contribution to both fisheries and escapement (Table 15). Thermal marking is currently the only method of marking being applied to chum from Nitinat hatchery (due to the dropping of the Multiple Fin Clip program). Transplanting thermally marked chum into Klanawa River began with the 2001 brood year in an attempt to help re-establish that stock.

Conuma Hatchery first began thermal marking several stocks with the 1998 brood year. The first return year for which all hatchery fish will be thermally marked was 2003. A comprehensive sampling program occurred during the fall chum fisheries and permitted a better understanding of timing and distribution of the different stocks in Nootka Sound.

Enhanced contributions of chum from major hatchery facilities are based on marking a portion of the fry released with an adipose clip and coded-wire tag (Ad-cwt) or a ventral finclip with or without an adipose clip, and subsequent recovery of these marks in the commercial fishery and escapement programs. Marked fry are enumerated individually at marking. Released chum marked with finclips include the Big Qualicum River (since 1964) and Little Qualicum River (1979–2002), the Chilliwack River (1980–1997), the Nitinat River (1980–1998), Pallant Creek (1978–1997), and Conuma River (1978–2001). Released chum marked with adipose clips (Ad) and coded-wire-tags (CWTs) include the Puntledge River (1980–1997), Chehalis River (1983–1998), Inch Creek (1978–2001), Sliammon River (1994–2000), and Stave River (1982–1997). Unmarked fry represented by the mark are enumerated by subtracting egg and fry mortalities from the egg number which is usually calculated using electronic egg counters. Since egg and fry mortality generally is less than 10%, fry enumeration is considered very accurate. Not all release groups are represented by a mark. Contributions for those groups are estimated by associating them with a marked release group with a similar size and release timing. Tables 16 and 17 provide a summary of marks applied from 1999–2006.

Table 15. Releases of thermally marked chum salmon from WCVI based Canadian hatchery facilities, 2000–2006.

Brood Year	Hatchery Facility							
	Nitinat Release Sites		Conuma Release Sites					
	Nitinat River & Lake	Klanawa River	Conuma River	Conuma Estuary	Thupana River	Sucowa River	Canton River	Deserted River
2000	5,153,902		543,511	1,296,654	998,400	139,090	1,009,746	269,284
2001	27,093,836	3,162,846	569,118	1,649,290	390,754	200,803	1,070,539	272,395
2002	22,757,842	2,915,502	0	1,792,758	1,038,542	445,007	892,140	341,635
2003	21,252,421	2,516,338	0	1,585,534	425,261	410,872	484,570	798,330
2004	32,684,608	2,631,539	0	1,882,230	932,556	1,023,658	679,554	0
2005	36,724,205	2,739,742	0	914,381	744,834	256,296	434,449	0
2006	26,323,943	2,585,428	1,455,119	0	1,139,028	181,333	133,731	0

Table 16. Releases of CWT (coded-wire tag) chum salmon (and the associated unclipped releases) from southern BC based Canadian hatchery facilities, 2000–2006.

Brood Year	Hatchery Release Sites							
	Inch Creek				Sliammon River			
	CWT + Adipose clip	Adipose clip only	Unclipped	Total	CWT + Adipose clip	Adipose clip only	Unclipped	Total
2000	49,759	264	926,658	976,681	99,615	879	500,628	601,122
2001	49,931	100	1,124,599	1,174,630	-	-	-	0

Table 17. Releases of marked chum salmon (Clip Type—AD: adipose; LV: left ventral; RV: right ventral; AN: anal; D: dorsal) from southern BC based Canadian hatchery facilities, 2000–2006.

Stock	Brood Year	Clip Type	# Clipped	# Poor Clips / Unclipped	Total
Big Qualicum River	2001	ADRV	245,794	8,596	254,390
	2002	ADRV	252,260	10,359	262,619
	2003	ADRV	251,939	4,856	256,795
	2004	ADRV	261,366	6,579	267,945
	2005	ADRV	252,585	9,775	262,360
	2006	ADRV	252,016	6,853	258,869
Conuma River	2000	ADLV	97,906	4,720	102,626
	2001	ADLV	102,059	4,018	106,077
Deserted/NWVI	2000	RV	76,928	1,174	78,102
Little Qualicum River	2001	ADLV	266,330	7,874	274,204
	2002	ADLV	249,887	120	250,007
Salloomt River	2001	LV	97,015	4,595	101,610
	2002	LV	100,637	4,742	105,379
	2003	LV	103,148	1,054	104,202
Theodosia River	2002	LV	101,029	0	101,029
Sucwoa River	2000	LV	76,400	0	76,400
	2001	LV	76,516	0	76,516
Sugsaw Creek	2000	LV	13,000	0	13,000
	2001	LV	31,000	0	31,000
	2002	LV	11,000	0	11,000
	2003	LV	11,000	0	11,000
	2004	LV	20,600	0	20,600

6.3 Genetic Stock Identification

United States

In 2006, 837 DNA tissue samples were collected from 11/3/2006 through 11/16/2006 in the Puget Sound Area 9, (Washington State mixed stock fishing area), test fishery as the second year of an on-going study. Work also continued in Puget Sound on specific project areas. One such project was the continuing work of the Tulalip Tribes on genetically marked fall chum salmon. Another project, by WDFW, focused on the interrelationships of summer chum salmon—currently listed as threatened, under provisions of the United States' ESA (Kassler and Shaklee, 2003).

The Tulalip Tribes continued to assess the persistence of genetically marked fall chum salmon, from the Tulalip Hatchery, based on selection from brood years 1990 through 1993. This work, while it confirmed the persistence of the marks (allelic frequencies at mIDHP-1 and mMEP-2), initially established to serve as indices in U.S. and Canadian fisheries, focused on the persistence and variation of this population's entry pattern, as well as straying frequency and distribution. To this endeavor, samples were collected from adults, in fisheries and spawning grounds, as well as emigrating juveniles, from nearshore marine areas (Rawson, 2005).

WDFW used genetic techniques to clarify otolith marking data in the monitoring of Hood Canal summer chum supplementation projects. All returning supplementation-origin summer chum were otolith-marked, but there was ambiguity between marks for some programs, meaning that fish could be identified as supplementation or natural-origin, but some supplementation fish could not be identified to their program of origin. Where possible, analysis of DNA samples from fish with ambiguous marks was used to identify fish to the program of origin.

Canada

GSI samples were collected during the Johnstone Straits competitive purse seine fisheries in 2006. A summary of historic chum GSI sampling is presented in Table 18.

Table 18. Number of chum salmon sampled for GSI data, 1997–2006.

Year	Commercial Samples			Test Fishery Samples		
	Johnstone Strait	Qualicum	Nitinat	Johnstone Strait	Qualicum	Nitinat
1997	0	0	0	0	0	0
1998	150	0	0	150	0	0
1999	0	0	0	0	0	0
2000	300	0	0	0	0	0
2001	300	0	0	0	0	0
2002	0	0	0	0	0	0
2003	600	0	0	100	0	0
2004	600	0	0	0	0	0
2005	0	0	0	0	0	0
2006	720	0	0	0	0	0

6.3.1 Baseline Collection for DNA Stock Identification.

In 2006 WDFW continued its baseline sampling of relevant Washington State populations of adult chum salmon (Table 19). Fin tissues were clipped and stored in alcohol for future analyses of DNA-based genetic variability.

6.3.2 Microsatellite DNA (mSAT) standardization.

No additional standardization work was conducted in 2006. Work in 2005 (Beacham *et al.* 2005) identified fifteen loci for which concordance in allele scoring between the laboratories was 99% (Table 20, column A). Research was funded by the Southern Boundary Research and Enhancement Fund 2004-2005. Contacts: Terry Beacham, PBS and Sewall Young, WDFW.

Table 19. Chum salmon genetics tissue collections from Washington in 2006 (T. Johnson *et al.* 2007).

Collection Code	Run Type	2006 Collection Name	Number of Samples
06DX	SU	Jimmycomelately Creek (Sequim)	64
06EC	SU	Dosewallips River	110
06ED	SU	Duckabush River	146
06EE	SU	Hamma Hamma River	334
06EF	SU	Lilliwaup River	308
Summer Run Total			962
07ES	unknown	Jimmycomelately Creek (Sequim)	7
07GF	mixed	Union River	159
07GO	mixed	Jimmycomelately Creek (Sequim)	90
07GP	mixed	Salmon Creek	32
07GQ	mixed	Snow Creek	35
07GR	mixed	Chimacum Creek	21
07GT	mixed	Dosewallips River	62
07GU	mixed	Duckabush River	129
07GV	mixed	Hamma Hamma River	204
07GW	mixed	Lilliwaup River	109
07KH	hatchery	Grays River Hatchery	134
07KX	unknown	Area 7 / 7a	197
Mixed Run Total			1,179
06HA	Fall	Grays River	117
Fall Run Total			117
TOTAL			2,258

Table 20. List of mSAT loci used in two separate chum salmon surveys—bolded mSAT loci are those loci used in both surveys.

A. Beacham <i>et al.</i>	B. NWFSC unpublished
Oke3	
Ok2	Ok1
Ok100	
One102	One102
One114	One114
	One18
	Ots311
Omm1070	
Omy1011	Omy1011
One103	
One104	
	One108
One111	One111
Ots103	Ots103
	Ots2m
Ots3m	Ots3m
Ots68	
One101	One101
	One106
Ssa419	Ssa419

6.3.3 Forensic use of mSATs in Puget Sound.

Data for 14 mSAT loci were generated to evaluate differences between fall- and summer-run chum salmon stocks in Puget Sound (see Table 21, col. B). Clear differences between the two groups were detected (Figure 1). Eight loci in this study were common to the Beacham *et al.* 2005 report (see Table 21, columns A & B). Ref: unpublished data, NWFSC. Contacts: P. Schwenke and G. Winans. Gary.Winans@NOAA.gov. See also Small and Young, 2003.

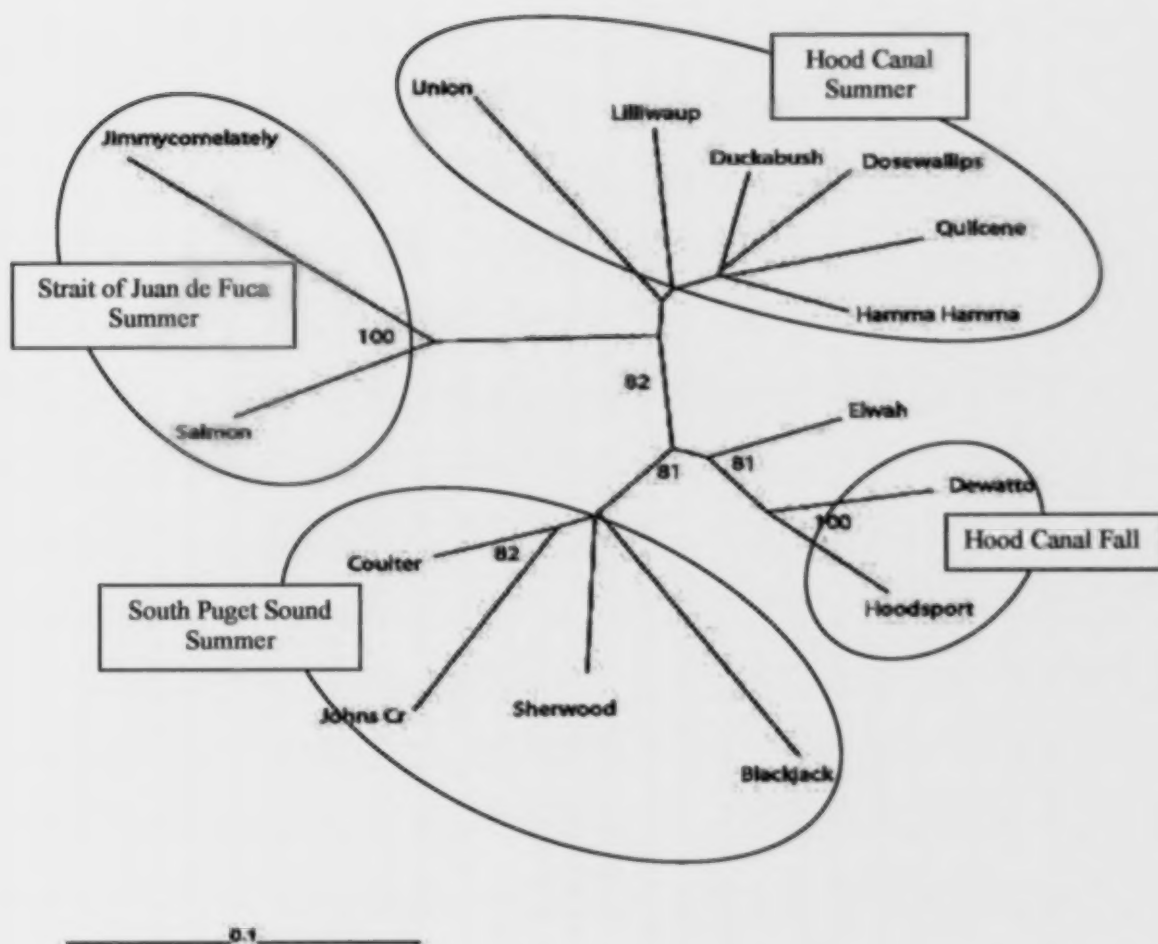


Figure 1. Puget Sound chum salmon relationships based on 14 mSAT loci (unpublished data, NWFSC, Seattle, WA).

6.3.4 Single Nucleotide Polymorphisms (SNPs) markers.

6.3.4.1 United States

A Pacific Rim survey evaluated genetic variation at 31 SNPs loci (Seeb *et al.* 2005). Several Washington-state collections were included in the study; no B.C. stocks were made available. Substantial differences were observed between fall- and summer-run stocks in Puget Sound (Attachment 3). Loci are listed in Table 21; stocks included in the analysis are included in Table 22. Contacts: Lisa Seeb, Lseeb@u.washington.edu.

Table 21. Mitochondrial (mtDNA) and nuclear single nucleotide polymorphisms assayed in chum salmon. Sources describing each SNP giving conditions for genotyping via the 5'-nuclease reaction are given. Source references: SNP loci from Seeb *et al.* 2005.

Assay	Locus	Source
mtDNA SNPs	<i>Oke_Cr231</i>	Sato <i>et al.</i> 2001; Smith <i>et al.</i> 2005a
	<i>Oke_Cr30</i>	Sato <i>et al.</i> 2001; Smith <i>et al.</i> 2005a
	<i>Oke_Cr386</i>	Sato <i>et al.</i> 2001; Smith <i>et al.</i> 2005a
	<i>Oke_Cr42</i>	Sato <i>et al.</i> 2004
	<i>Oke_Cr96</i>	Sato <i>et al.</i> 2004
	<i>Oke_ND3-69</i>	Smith <i>et al.</i> 2005a
nuclear SNPs	<i>Oke_arf-31</i>	Smith <i>et al.</i> 2005b
	<i>Oke_BAMBI-116</i>	Smith <i>et al.</i> 2005b
	<i>Oke_CKS_2-389</i>	Smith <i>et al.</i> 2005a
	<i>Oke_copa-211</i>	Smith <i>et al.</i> 2005b
	<i>Oke_DM20-548</i>	Smith <i>et al.</i> 2005a
	<i>Oke_eif4ebp2-64</i>	Smith <i>et al.</i> 2005b
	<i>Oke_GHII-2943</i>	Unpublished
	<i>Oke_GHII-3129</i>	Unpublished
	<i>Oke_GnRH_3-373</i>	Smith <i>et al.</i> 2005b
	<i>Oke_GnRH-527</i>	Smith <i>et al.</i> 2005b
	<i>Oke_GPDH-191</i>	Smith <i>et al.</i> 2005b
	<i>Oke_HGFA-319</i>	Smith <i>et al.</i> 2005b
	<i>Oke_hsc71-199</i>	Smith <i>et al.</i> 2005b
	<i>Oke_il-1racp-67</i>	Smith <i>et al.</i> 2005b
	<i>Oke_IL8r2-406</i>	Smith <i>et al.</i> 2005b
	<i>Oke_IL8r-272</i>	Smith <i>et al.</i> 2005b
	<i>Oke_Moesin160</i>	Smith <i>et al.</i> 2005b
	<i>Oke_ras1-426</i>	Unpublished
	<i>Oke_RFC2-618</i>	Smith <i>et al.</i> 2005b
	<i>Oke_RH1op-245</i>	Smith <i>et al.</i> 2005b
	<i>Oke_SClkF2R2-239</i>	Smith <i>et al.</i> 2005b
	<i>Oke_serpin140</i>	Smith <i>et al.</i> 2005b
	<i>Oke_Tsha1-196</i>	Smith <i>et al.</i> 2005b
	<i>Oke_u1-519</i>	Smith <i>et al.</i> 2005a
	<i>Oke_u202-131</i>	Smith <i>et al.</i> 2005b
	<i>Oke_u212-87</i>	Smith <i>et al.</i> 2005b
	<i>Oke_u216-222</i>	Smith <i>et al.</i> 2005b
	<i>Oke_u217-172</i>	Smith <i>et al.</i> 2005b
	<i>Oke_u200-385</i>	Smith <i>et al.</i> 2005b
	<i>Oke_Zp3b-314</i>	Smith <i>et al.</i> 2005b

Table 22. Washington Stocks and number of fish included in SNP analysis.

Location	Sample Size	Stock Type
Big Mission Creek	11	Fall
Dewatto River	16	Fall
Elwha River	95	Fall
Hoodspout	16	Fall
Nisqually River	95	Fall
Hamma River	16	Summer
Quilcene	16	Summer
Union River	16	Summer

6.3.4.2 Canada

Canadian tissue samples for DNA analysis have been collected over a number of years (Table 23). Early DNA work consisted of experimental work on identifying appropriate markers for stock separation. Samples continue to be collected to provide a complete baseline for southern British Columbia Inside chum stocks. Additional samples were collected in 2006.

Table 23. Chum sample tissue collections for mSat and SNPs analysis from southern British Columbia (sample sizes greater than or equal to 50).

Population Name	Collection Year(s)	mSat Sample Size	SNPs Sample Size
Ahnuhati River	2004, 2005, 2006	204	
Algard Creek	2003	99	
Alouette North	2004, 2006	57	100
Big Qualicum River	2006		75
Campbell River	2002	193	
Cayeghle Creek	2002, 2003, 2004	137	
Cheakamus River	1992, 2003	91	
Chehalis River	1991	98	
Chemainus River	1992, 1997	167	
Chilliwack River	1992, 2004	197	
Chilqua Creek	2004, 2005	202	
Cold Creek	2002	193	
Colonial Creek	2002	221	
Conuma River	2006		100
Cowichan River	1997, 2000, 2006	273	150
Demamiel Creek	1992	50	
Glendale River	2003, 2004	94	
Goldstream River	1991, 1992, 1997, 1999	285	
Goodspeed River	2002	195	
Harrison River	2002	201	
Harrison River Lates	2006	100	
Heydon Creek	1998, 2001, 2003	249	
Homathko River	2004	203	
Inch Creek	2002, 2003, 2006	405	100

Table 23. Chum sample tissue collections for mSat and SNPs analysis from southern British Columbia (sample sizes greater than or equal to 50) *continued*.

Indian River	2000, 2002	344	
Kanaka Creek	2004, 2005, 2006	155	
Kawkawa Creek	2004	65	
Klinaklini River	1997, 2002	116	
Little Qualicum River	1991, 2006	50	103
Lower Lillooet River	2002	122	
Mamquam River	1991 2002, 2004	152	
Mashiter Creek	2004	56	
Nahmint River	2003, 2006	195	100
Nanaimo River	1991, 1997, 2001, 2002, 2006	249	200
Nimpkish River	2002, 2004	409	100
Nitinat River	1992, 2004, 2006	243	100
Norrish Creek	2004, 2006	208	100
Orford River	2003	101	
Pegattum Creek	2002	63	
Puntledge River	1991, 2006	50	100
Sarita River	2006		70
Shovelnose Creek	2004	147	
Slammon River	1991	50	
Silverdale Creek	2000, 2004, 2005	166	
Smith Creek	1997	88	
Sooke River	2006		50
Southgate River	2003, 2004	222	
Squakum Creek	2000, 2004, 2005	275	
Squamish River	2002, 2003	84	
Stave River	1991, 2003	243	
Sugsaw Creek	2004, 2006	90	70
Theodosia River	2002	144	
Tzoonie River	1991	50	
Vedder River	2002, 2003	75	
Viner Sound Creek	2002, 2003	204	
Wahleach Slough	1991	50	
Weaver Creek	2006		100
Widgeon Slough	2004	191	
Worth Creek	2005	107	
Wortley Creek	2002	242	

REFERENCES

- Beacham, T.D., M.H. Wetklo, D.K. Hawkins, and S.F. Young. 2005. Development of a standardized suite of microsatellite loci to be used in the establishment of a chum salmon baseline for southern British Columbia and Washington. Project report. June 2005. 35 p.
- Gazey, W.J. and R.V. Palermo. 2000. A preliminary review of a new model based on test fishing data analysis to measure abundance of returning chum stocks to the Fraser River. DFO Canadian Stock Assessment Secretariat Research Document 2000/159. 30 p. http://www.dfo-mpo.gc.ca/csas/Csas/English/Research_Years/2000/2000_159E.htm.
- Johnson, T., J. Ames, K. Adicks, C. Weller, N. Lampsakis. 2006. 2005 progress report on Hood Canal and Strait of Juan de Fuca summer chum salmon. Unpublished memorandum report, WDFW and PNPTC.
- Kassler, T. and J. Shaklee. 2003. An Analysis of the Genetic Characteristics and Interrelationships of Summer Chum in Hood Canal and Strait of Juan de Fuca and of Chum in Curley Creek (Puget Sound) Using Allozyme Data. *In*: Summer Chum Salmon Conservation Initiative; Supplemental Report No. 4. Washington Department of Fish and Wildlife and Point No Point Treaty Tribes. *In*: <http://wdfw.wa.gov/fish/chum/chumsupp4.pdf>.
- Rawson, K. 2005. Initial results 2002, 2003 (adult) and 2003 (fry) chum GSI collections. Tulalip Tribes Unpublished Report, Tulalip, Washington, 98271.
- Ryall, P., C. Murray, V. Palermo, D. Bailey, and D. Chen. 1999. Status of clockwork chum salmon stock and review of the Clockwork Management Strategy. DFO Canadian Stock Assessment Secretariat Research Document 99/169. 134 pp. http://www.dfo-mpo.gc.ca/csas/Csas/English/Research_Years/1999/a99_169e.htm.
- Sato SJ, Ando H, Ando S, Urawa S, Urano A, Abe S. 2001. Genetic variation among Japanese populations of chum salmon inferred from nucleotide DNA control region. *Zoological Science*, 18, 99–106.
- Sato, S., H. Kojima, J. Ando, H. Ando, R. L. Wilmot, L. W. Seeb, V. Efremov, L. Leclair, W. Buchholz, D. H. Jin, S. Urawa, M. Kaeriyama, A. Urano, and S. Abe. 2004. Genetic population structure of chum salmon in the Pacific Rim inferred from mitochondrial DNA sequence variation. *Environmental Biology of Fishes* 69: 37–50.
- Seeb L.W., W.D. Templin, C.T. Smith, C. Elfstrom, S. Urawa, R.L. Wilmot, and J.E. Seeb. 2005. SNPs provide an easily-standardized baseline for NPAFC studies of chum salmon. (NPAFC Doc. 907) 12 pages. Alaska Department of Fish and Game, 333 Raspberry Road, Anchorage, AK, USA 99518. Contacts: Lisa Seeb, Lseeb@u.washington.edu

- Small, Maureen P. and Sewall P. Young. 2003. A Genetic Analysis of Summer and Fall Chum Salmon Populations in Hood Canal, Strait of Juan de Fuca, and South Puget Sound Using Microsatellite Data. *In*: Summer Chum Salmon Conservation Initiative; Supplemental Report No. 4. Washington Department of Fish and Wildlife and Point No Point Treaty Tribes. *In*: <http://wdfw.wa.gov/fish/chum/chumsupp4.pdf>.
- Smith, C. T., J. Baker, L. Park, L. W. Seeb, C. Elfstrom, S. Abe, and J. E. Seeb. 2005a. Characterization of 13 single nucleotide polymorphism markers for chum salmon. *Molecular Ecology Notes* 5: 259–262.
- Smith, C. T., Elfstrom, C. M., Seeb, J. E., and Seeb, L. W. 2005b. Use of sequence data from rainbow trout and Atlantic salmon for SNP detection in Pacific salmon. *Molecular Ecology* 14 4193–4203.
- Washington Department of Fish and Wildlife and Point No Point Treaty Tribes. 2007. Five-year review of the Summer Chum Salmon Conservation Initiative: Supplemental Report No. 7, Summer Chum Conservation Initiative—An Implementation Plan to Recover Summer Chum in the Hood Canal and Strait of Juan de Fuca Region. December, 2007. Wash. Dept. Fish and Wildlife. Olympia, WA. 235 p., including Appendices. <http://wdfw.wa.gov/fish/chum/library/chumsupp7.pdf>.

ATTACHMENTS

ATTACHMENT 1:

ANNEX IV, CHAPTER 6, OF THE PACIFIC SALMON TREATY [2006 – 2008]

Southern British Columbia and Washington State Chum Salmon

The provisions of this Chapter shall apply for the period 2006 through 2008.

1. The Parties shall maintain a Joint Chum Technical Committee ("the Committee") reporting, unless otherwise agreed, to the Southern Panel and the Commission. The Committee will undertake to, *inter alia*:
 - (a) identify and review the status of stocks of primary concern;
 - (b) present the most current information on harvest rates and patterns on these stocks, and develop a joint data base for assessments;
 - (c) collate available information on the productivity of chum stocks to identify escapements which produce maximum sustainable harvests and allowable harvest rates;
 - (d) present historical catch data, associated fishing regimes, and information on stock composition in fisheries harvesting those stocks;
 - (e) devise analytical methods for the development of alternative regulatory and production strategies;
 - (f) identify information and research needs, to include future monitoring programs for stock assessment; and,
 - (g) for each season, make stock and fishery assessments and evaluate the effectiveness of management.
2. The catch composition of fisheries covered by this chapter will be estimated by post-season analysis using methods agreed upon by the Committee.
3. Canada and the United States shall assess catch levels and make attempts to collect additional genetic samples from any chum salmon caught during the July 1 through September 15 time period in the boundary area fisheries (U.S. Areas 4B, 5, 6C, 7 and 7A; Canadian Areas 18, 19, 20, 21, and 29).

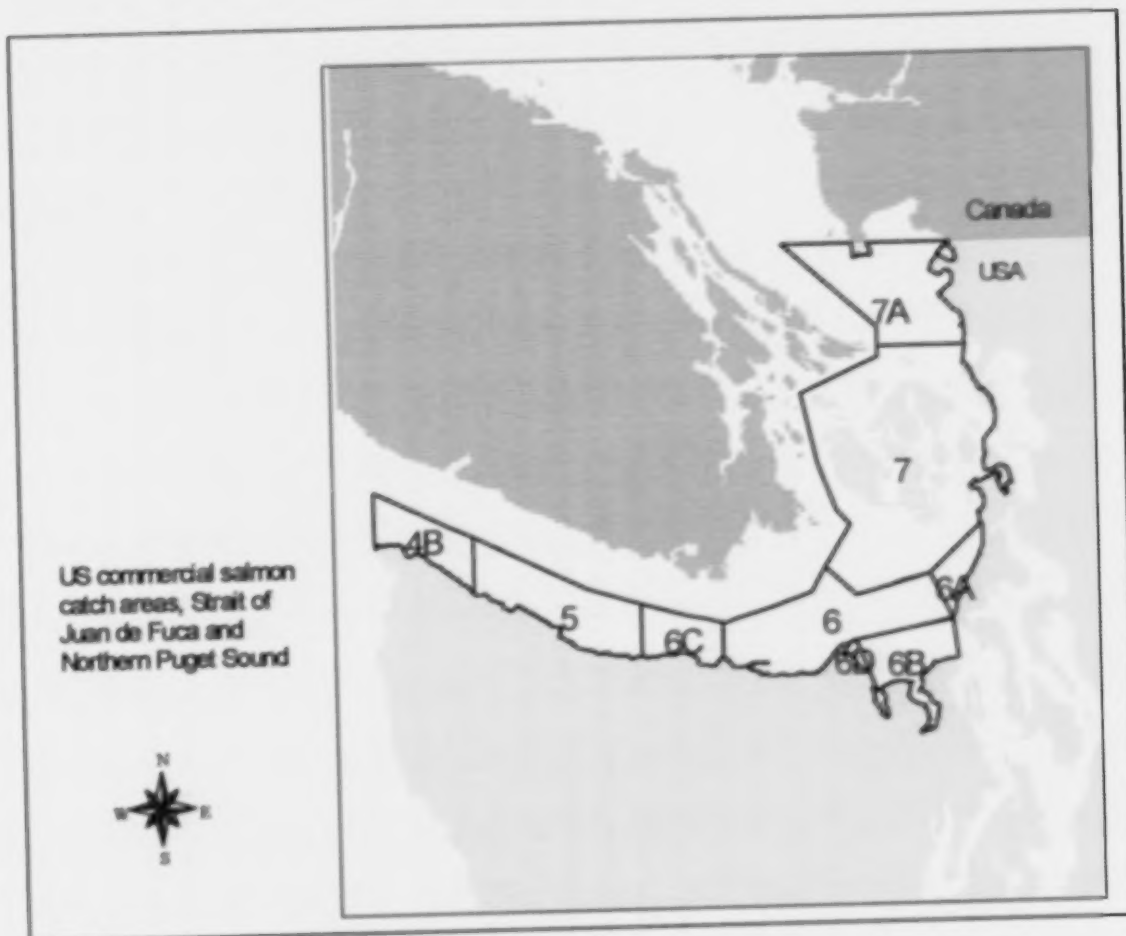
4. During the period from July 1 through September 15, Canada will require the live release of chum salmon from all purse seine gear fishing in the Strait of Juan de Fuca (Canadian Area 20) and the United States will require the same for the non-Indian seine fisheries in Areas 7 and 7A. Note: By U.S. regulation, purse seine fisheries are not permitted in U.S. Areas 4B, 5 and 6C.
5. In the years 2006 through 2008, Canada will manage its Johnstone Strait, Strait of Georgia, and Fraser River chum salmon fisheries to provide continued rebuilding of depressed naturally spawning chum salmon stocks, and, to the extent practicable, not increase interceptions of U.S. origin chum salmon. Terminal fisheries conducted on specific stocks with identified surpluses will be managed to minimize interception of non-targeted stocks.
6. In the years 2006 through 2008, Canada will manage its Johnstone Strait mixed stock fishery as follows:
 - a) In the years 2006 through 2008, chum salmon abundance levels of less than a provisional threshold of 1.1 million will be defined, for purposes of this chapter as critical. By the end of 2008, Canada will determine a revised critical threshold.
 - b) For run sizes above the critical threshold, Canada will conduct fisheries with a combined exploitation rate of up to 20% in Johnstone Strait.
 - c) When run sizes are expected to be below the critical threshold, Canada will notify the United States and will only conduct assessment fisheries and non-commercial fisheries. Other commercial fisheries targeting chum salmon will be suspended.
7. In the years 2006 through 2008, Canada will manage its Fraser River fisheries for chum salmon as follows:
 - a) For Fraser River terminal area run sizes, identified in-season, at abundance levels lower than 900,000 chum salmon, the Canadian commercial chum salmon fisheries within the Fraser River and in associated marine areas (Area 29), will be suspended.
 - b) For Fraser River terminal area run sizes, identified in-season at levels greater than 900,000 chum salmon, Canadian commercial chum salmon fisheries within the Fraser River, shall be guided by the limits of the in-river Total Allowable Catch set by Canada.
8. Canada will manage the Nitinat gill net and purse seine fisheries for chum salmon to minimize the harvest of non-targeted stocks.

9. For the years 2006 through 2008, Canada shall conduct a genetic sampling program of chum salmon taken in the West Coast Vancouver Island troll fishery if early-season catch information indicates that catch totals for the July 1 through September 15 season may reach levels similar to 1985 and 1986. Sampling, should it occur, will include catches taken from the southern areas (Canadian Areas 121-124).
10. In the years 2006 through 2008, the United States will manage its chum salmon fishery in Areas 7 and 7A as follows:
 - a) In the years 2006 through 2008, chum salmon abundance levels of less than a provisional threshold of 1.1 million will be defined, for purposes of this chapter, as critical. By the end of 2008, Canada will determine a revised critical threshold.
 - b) For run sizes above the critical threshold, the base catch ceiling for the U.S. chum salmon fisheries in Areas 7 and 7A will be 130,000 chum salmon.
 - c) For run sizes below the critical threshold, the U.S. catch of chum in Areas 7 and 7A shall be limited to chum salmon taken incidentally to other species and in other minor fisheries, but shall not exceed 20,000, provided that catches for the purpose of genetic stock identification sampling shall not be included in the aforementioned limit.
 - d) The Fraser River chum salmon abundance estimate will be updated no later than October 22. If the run size is estimated to be less than 900,000, the United States will take immediate action to restrict its fishery impacts on Fraser chum. The Parties will then meet within 3 days of the update to discuss further U.S. fishing opportunities to meet conservation objectives.
 - e) U.S. commercial fisheries for fall chum salmon in Areas 7 and 7A will not occur prior to October 10.
 - f) The United States will manage the Areas 7 and 7A fisheries for chum salmon with the intent to minimize, to the extent practicable, the harvest of non-targeted species.
11. In the years 2006 through 2008, the United States' annual total harvest ceiling for chum salmon in Areas 7 and 7A, shall be defined as follows:
 - a) It is the intent of the parties to eliminate the accumulated historical difference (138,000 total, as of the start of 2006), by 2008. Therefore, in any non-critical year in which a portion of the assigned difference is not taken, that portion shall be foregone.

- b) When the chum salmon run size is below the critical threshold, the base catch ceiling will be 20,000 chum salmon. When the fishery is limited to 20,000 chum salmon, the portion of the accumulated historical difference will not be added to the catch ceiling and the remaining accumulated historical difference will be recalculated and applied to subsequent years, up to and including 2008.
 - c) When the chum salmon run size is above the critical threshold, the base catch ceiling will be 130,000 chum salmon, plus 46,000 chum salmon of the accumulated historical difference, plus any shortfall of up to a maximum of 15,000 chum salmon generated from a failure to capture the preceding non-critical year's base catch ceiling, minus any amortized overage adjustment caused by a prior year's overage of that year's total harvest ceiling.
 - d) It is also the intent of the Parties to avoid future accumulations. Therefore any annual shortfall below the base catch ceiling of 130,000 chum salmon shall be limited to a maximum of 15,000 chum salmon and shall be added to the next available non-critical season's base ceiling. If it is not taken in that fishery, it shall be foregone.
 - e) Adjustments due to past overages shall not be limited, but they may be amortized over subsequent years, up to and including 2008.
 - f) When the chum salmon run size is below the critical threshold, no shortfalls may be accrued; however, any overages shall be carried forward as indicated above.
12. In the years 2006 through 2008, the United States shall conduct its chum salmon fishery in the Strait of Juan de Fuca (United States Areas 4B, 5 and 6C) so as to maintain the limited effort nature of this fishery, and, to the extent practicable, not increase interceptions of Canadian origin chum salmon. The United States shall continue to monitor this fishery to determine if recent catch levels indicate an increasing level of interception.
13. All information concerning by-catch of other salmon species from the chum salmon fisheries covered by this chapter will be shared between the Parties in the annual Post Season Report.

ATTACHMENT 2:

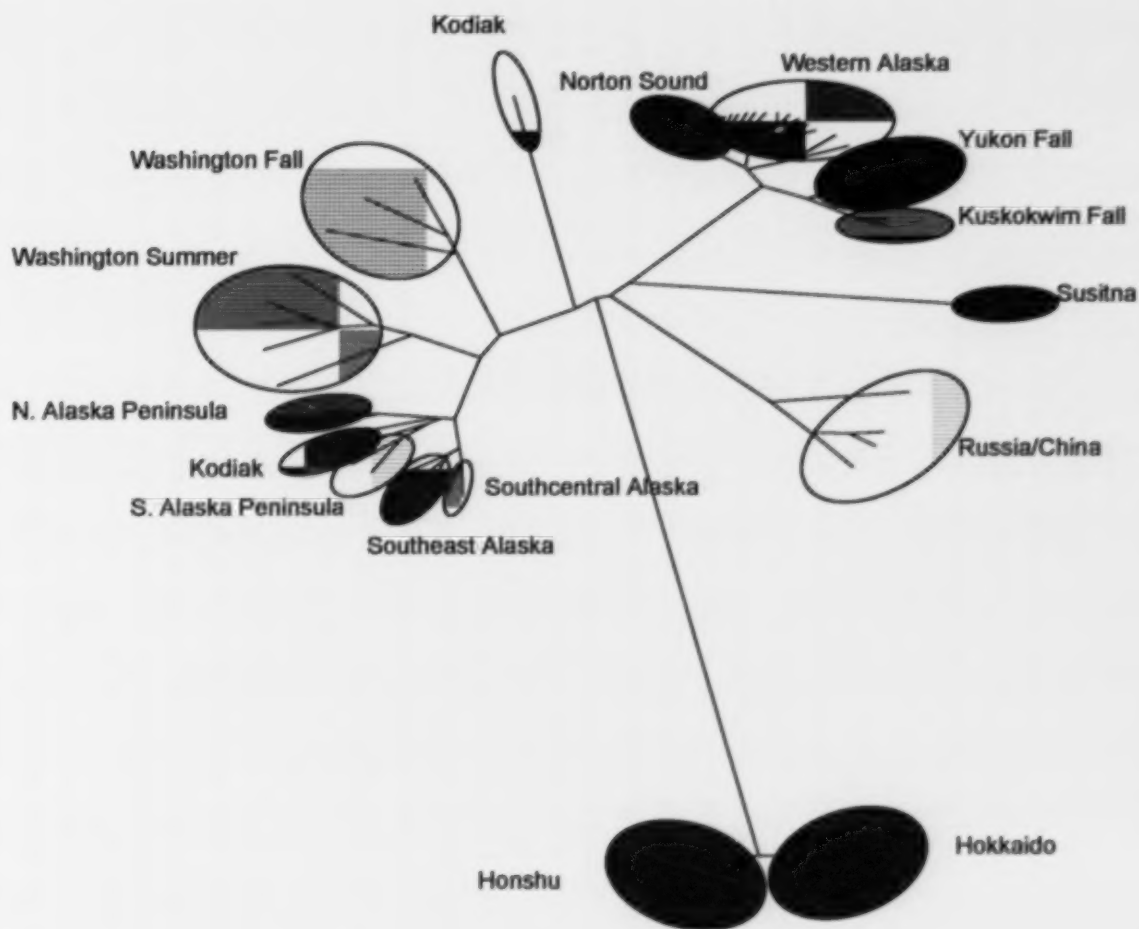
UNITED STATES AND CANADIAN STATISTICAL AREA MAPS



ATTACHMENT 3:

Pacific Rim survey evaluation of genetic variation at 31 single nucleotide polymorphism (SNP) loci (Seeb et al. 2005).

Several Washington State collections were included in the study; no B.C. stocks were made available.



APPENDICES

APPENDIX 1:

ANNEX IV, CHAPTER 6, OF THE PACIFIC SALMON TREATY

Chapter 6:

Southern British Columbia and Washington State Chum Salmon

The provisions of this Chapter shall apply for the period 1999 through 2008.

1. The Parties shall maintain a joint Chum Technical Committee ("the Committee") reporting, unless otherwise agreed, to the Southern Panel and the Commission. The Committee will undertake to, *inter alia*:

- (a) identify and review the status of stocks of primary concern;
- (b) present the most current information on harvest rates and patterns on these stocks, and develop a joint database for assessments;
- (c) collate available information on the productivity of chum stocks to identify escapements which produce maximum sustainable harvests and allowable harvest rates;
- (d) present historical catch data, associated fishing regimes, and information on stock composition in fisheries harvesting those stocks;
- (e) devise analytical methods for the development of alternative regulatory and production strategies;
- (f) identify information and research needs, to include future monitoring programs for stock assessment; and
- (g) for each season, make stock and fishery assessments and evaluate the effectiveness of management.

2. In the years 1999 through 2008, Canada will manage its Johnstone Strait, Strait of Georgia, and Fraser River chum fisheries to provide continued rebuilding of depressed naturally spawning chum stocks, and, to the extent practicable, minimize increased interceptions of United States origin chum. Terminal fisheries conducted on specific stocks with identified surpluses will be managed to minimize interception of non-targeted stocks.

3. In the years 1999 through 2008,

- a) for Johnstone Strait run sizes less than 3.0 million

(i) Canada, taking into account the catch of Canadian chum in United States Areas 7 and 7A, will limit its harvest rate in Johnstone Strait to less than 10 percent, resulting in a Johnstone Strait catch level of up to 280,000 chum; and

(ii) when the catch in Johnstone Strait is 280,000 chum or less, the United States catch of chum in Areas 7 and 7A shall be limited to chum taken incidentally to other species and in other minor fisheries, but shall not exceed 20,000, provided, however, that catches for the purposes of electrophoretic sampling shall not be included in the aforementioned limit;

(b) for Johnstone Strait run sizes from 3.0 million to 3.9 million

(i) Canada, taking into account the catch of Canadian chum in United States Areas 7 and 7A, will limit its harvest rate in Johnstone Strait to 20 percent, resulting in a Johnstone Strait catch level of 280,000 to 745,000 chum; and

(ii) when the catch in Johnstone Strait is from 280,000 to 745,000 chum, the United States catch of chum in Areas 7 and 7A shall not exceed 120,000;

(c) for Johnstone Strait run sizes of 3.9 million and greater

(i) Canada, taking into account the catch of Canadian chum in United States Areas 7 and 7A, will harvest at a rate in Johnstone Strait of 30 percent or greater, resulting in a Johnstone Strait catch level of 745,000 chum or greater; and

(ii) when the catch in Johnstone Strait is 745,000 chum or greater, the United States catch of chum in Areas 7 and 7A shall not exceed 140,000;

(d) it is understood that the Johnstone Strait run sizes, harvest rates, and catch levels referred to in 3(a), 3(b), and 3(c) are those determined in season, in Johnstone Strait, by Canada; and

(e) the United States shall manage in a manner that, as far as practicable, maintains a traditional proportion of effort and catch between United States Areas 7 and 7A, and avoids concentrations of effort along the boundary in Area 7A.

4. In the years 1999 through 2008, the United States shall conduct its chum fishery in the Strait of Juan de Fuca (United States Areas 4B, 5 and 6C) so as to maintain the limited effort nature of this fishery, and, to the extent practicable, minimize increased interceptions of Canadian origin chum. The United States shall continue to monitor this fishery to determine if recent catch levels indicate an increasing level of interception.
5. If, in any year, the United States chum fishery in Areas 7 and 7A fails to achieve the catch levels specified in paragraphs 3(a)(ii), 3(b)(ii) and 3(c)(ii), any differences shall be compensated by adjustments to the Areas 7 and 7A fishery in subsequent years, except that chum catches below the level specified in paragraph 3(a)(ii) shall not be compensated.
6. Catch compositions in fisheries covered by this Chapter will be estimated by post-season analysis using methods agreed upon by the Committee.
7. Canada will manage the Nitinat net chum fishery to minimize the harvest of non-targeted stocks.
8. In the years 1999 through 2008, Canada shall conduct electrophoretic sampling of chum taken in the West Coast Vancouver Island troll fishery if early-season catch information indicates that catch totals for the season may reach levels similar to 1985 and 1986. Sampling, should it occur, will include catches taken from the southern areas (Canadian Areas 121-124).
9. During the period of August 1 through September 15 of each year, Canada will require the live release of chum salmon from all purse seine gear fishing in the Strait of Juan de Fuca (Canadian Area 20) and the United States will require the same for non-Indian seine fisheries in Areas 7 and 7A. Note: purse seine fisheries are not permitted in U.S. Areas 4B, 5 and 6C.
10. Canada and the United States shall assess catch levels and make attempts to collect additional genetic samples from any chum salmon caught during the August 1 through September 15 time period in the boundary area fisheries (U.S. Areas 4B, 5, 6C, 7 and 7A; Canadian Areas 18, 19, 20, 21 and 29).

APPENDIX 2:

COMMISSION GUIDANCE TO THE SOUTHERN PANEL ON THE MANAGEMENT OF SOUTHERN CHUM FISHERIES (FEBRUARY 13, 2004)

The purpose of this document is to provide Commission direction to the Southern Panel on the conduct of southern chum salmon fisheries for the years 2004 to 2008. This direction is not intended to replace Annex IV, Chapter 6 of the Pacific Salmon Treaty.

Johnstone Strait

For run sizes above the critical level of 800K–1.5M, Canada will conduct fisheries with a combined exploitation rate of up to 20% in Johnstone Strait. The Johnstone Strait Canadian commercial fisheries will follow a pre-season plan designed with a fixed fishing schedule to achieve a maximum of 15% exploitation rate.

For run sizes below the critical level, Canada will reduce its exploitation rate. Under a critical level run size, Canada will conduct assessment fisheries and other commercial fisheries will be suspended.

Fraser River

For Fraser River terminal fisheries, with an identified run size under 900,000 the Canadian commercial fishery will not occur within the Fraser River (Area 29). For run sizes greater than 900,000 Canadian commercial fisheries will likely not occur prior to October 22.

Agreement on Modification to the Limits for the U.S. Chum Salmon Fishery

1. Catch Ceiling

(a) If a critical abundance level, as provided by Canada, of inside southern bound chum stocks is not identified, the base catch ceiling for the U.S. Areas 7 and 7A chum fisheries will be 130,000 chum.

(b) If a pre-season critical abundance level forecast of inside southern bound chum stocks is expected and/or the first Canadian Johnstone Strait commercial seine fishery identifies this level, the U.S. catch of chum in Areas 7 and 7A will not exceed 20,000 consistent with Chapter 6, provision 3(a)(ii).

(c) U.S. Areas 7 and 7A chum fisheries will not occur prior to October 10.

(d) Fraser River chum abundance will be updated no later than October 22. If the run size is estimated to be less than 900,000, the U.S. will take immediate action to restrict their fishery impacts on Fraser chum. The Parties will then meet within 3 days of the update to discuss further U.S. fishing opportunities to meet conservation objectives.

2. Catch Compensation

(a) The intent of this agreement is to eliminate the total accumulated catch difference by 2008.

(b) Consistent with Annex IV, Chapter 6, paragraph 5, the difference between actual catches and catch levels specified by this chapter is a total historical accumulated difference of 228,300 chum, (1991 to 2003).

(c) The historical accumulated difference shall be amortized over the years of this agreement (in 2004 the amount is 46,000).

(d) Annual differences are defined as actual catches less than the 130,000 base catch ceiling or catches greater than the adjusted total annual catch ceiling. If the base catch ceiling is 20,000 any accumulated difference will be recalculated and re-applied to subsequent years.

(e) The total annual catch ceiling includes; first, the base catch ceiling, then the amortized historical accumulated difference and the amortized annual difference (to a maximum of 15,000 from any annual shortfall; no limit on overage). The total annual catch ceiling will be calculated each year.

(f) In any given year, if the U.S. fisheries fail to reach the total annual catch ceiling, the historical accumulated difference and annual difference will not be carried to subsequent years.

3. By-catch

All by-catch information will be shared between the Parties.

4. Agreement

This agreement will be in effect through 2008 or until the replacement of Annex IV, Chapter 6 related to chum. Modification to this agreement will be subject to approval of both parties.